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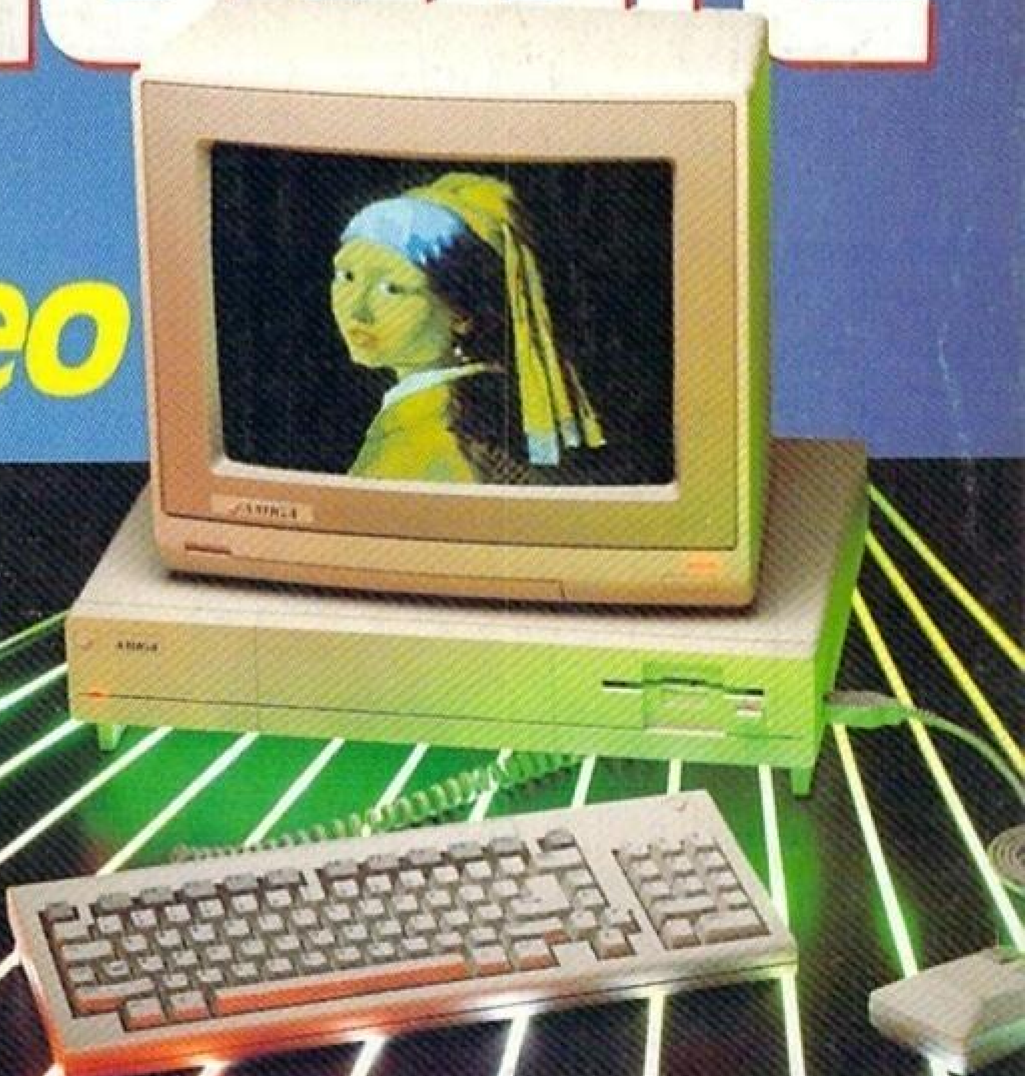

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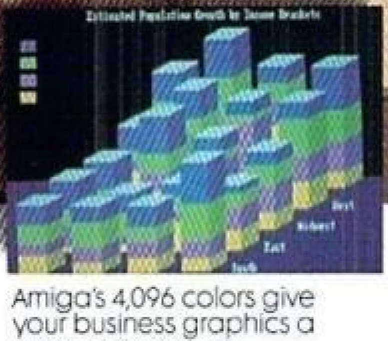
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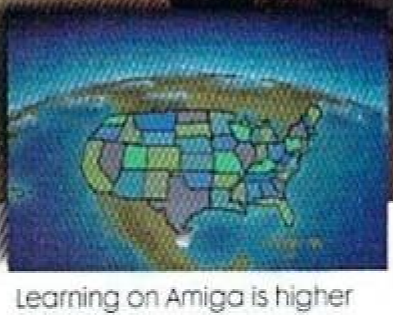

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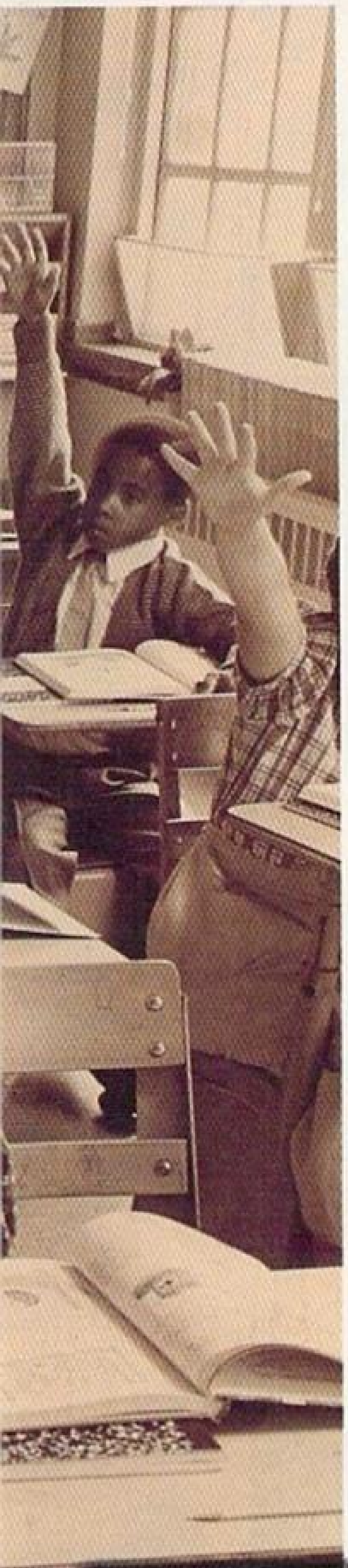

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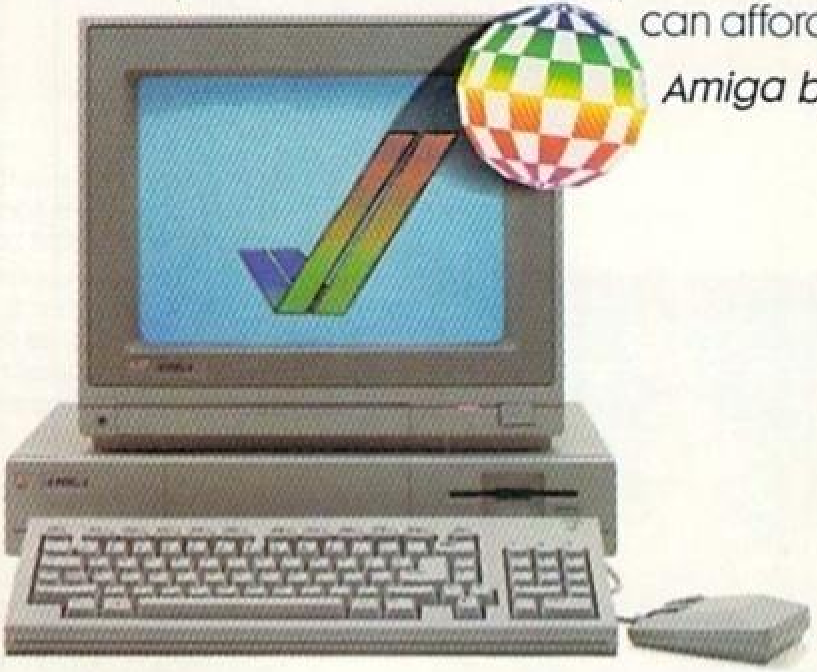

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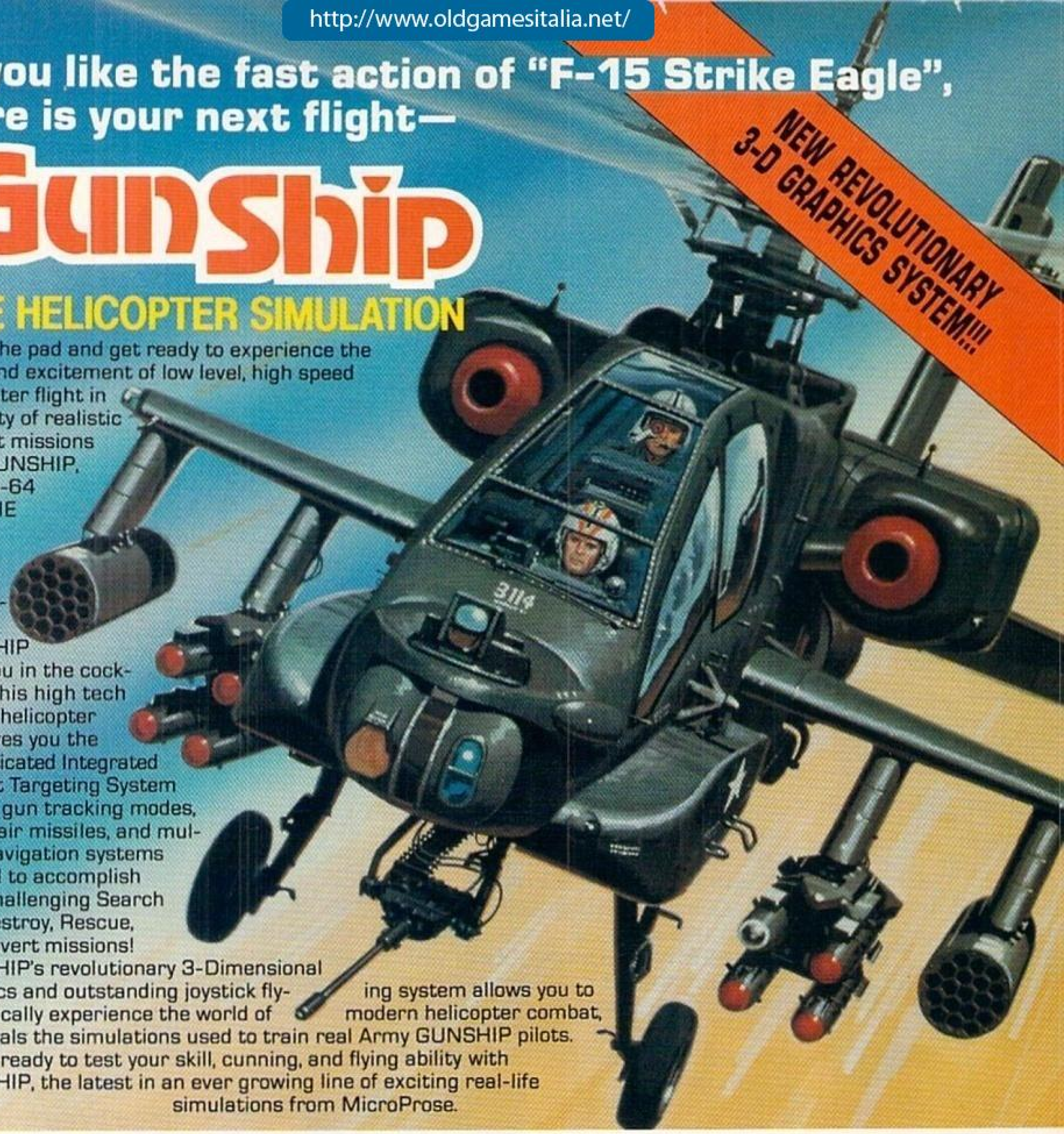

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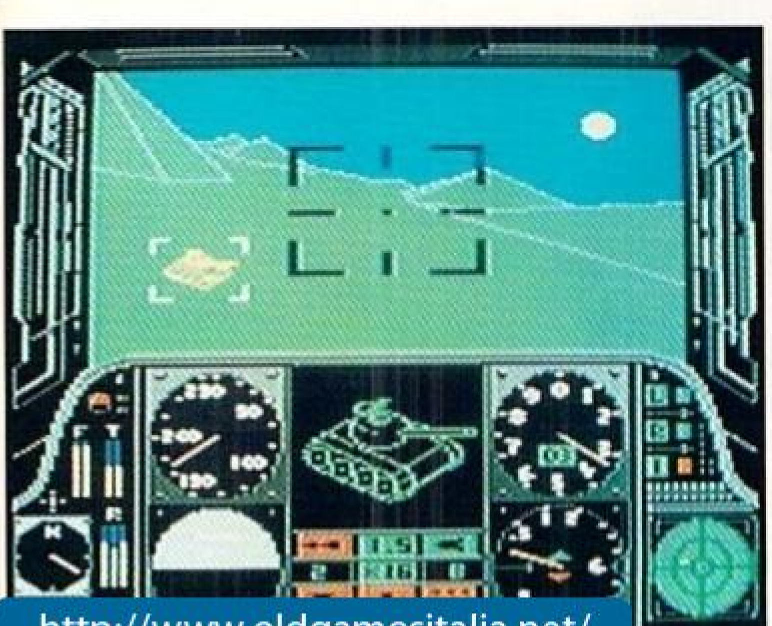

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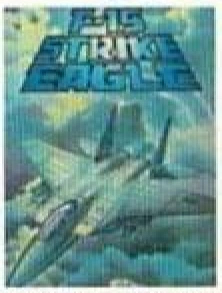

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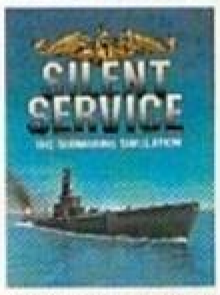

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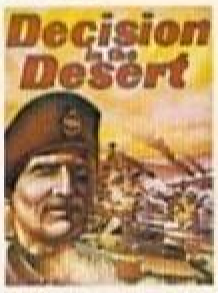

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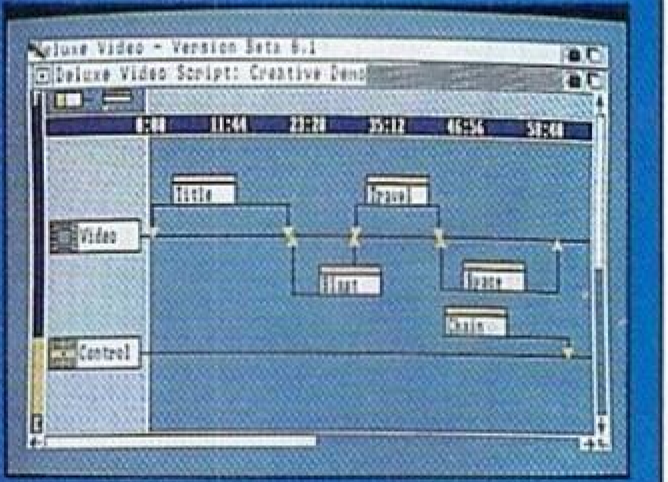
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11:44
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This brand new "video processor" for the Amiga from Electronic Arts can be used to create customized home videos, business presentations, animated commercials and anything else you can think of that lends itself to animation. by Matthew Leeds

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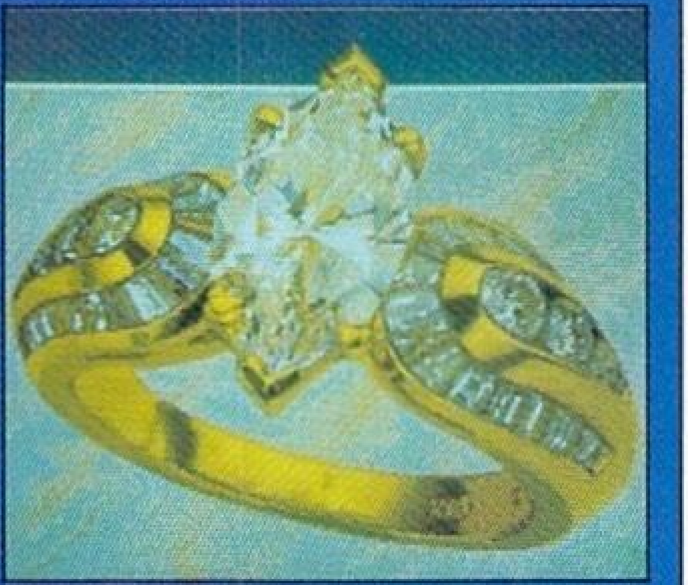

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They call it "play testing," but ten hours in front of a computer screen every day for six weeks doesn't sound much like play. A behind-the-scenes look at these "playtest pilots" of the computer game industry. by Shay Addams

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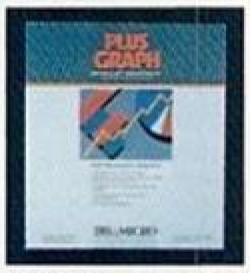

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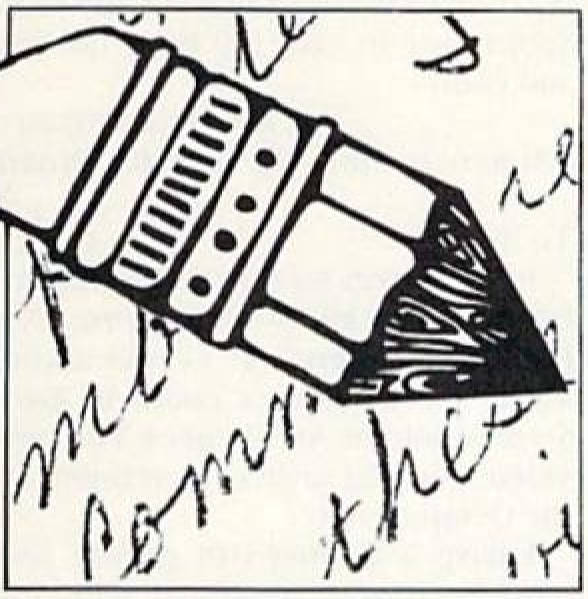
LETTERS



Two-Line Program Helper

To the Editor:

I feel that I have learned quite a lot about programming simply by typing in programs from your magazine. I would like to pass on to you this simple two-line program I developed that is very helpful in typing in programs with a lot of data lines. You simply add these two lines to the beginning of the program you are typing in, then delete them when you are done.

```
1 INPUT"LINE #";X:INPUT
  "INCREMENT";Y:FORZ=1TO20
2 PRINTX"DATA":X=X+Y:
  NEXT:PRINT"[HOME]
  [DOWN]":END
```

When you come to the part of the program with the data statements, type RUN and follow the instructions. "Line #" is the first data statement line. Increment is the amount used between lines by the author. When you hit RETURN, your screen will display 20 lines with the line number and the word "data." Your cursor should be on the first line. Just cursor over and start typing in the data statements. Then hit RETURN and that line has been added to your program.

Richard L. Eberhardy
Green Bay, Wisconsin

Easy Script Printer Codes

To the Editor:

In reference to the letter in the December/January 1985/86 *Commodore Power/Play* regarding special printer codes in *Easy Script*, I've found it easier to use the reverse "E" for the ESC code, CHR$(27). This leaves an additional number available for other commands in the zero to nine range. As explained on pages eight through ten, section 8.2.11.3, of the *Easy Script* manual, the reverse "E" is entered by hitting F1 followed by the up-arrow key. Then repeat F1 followed by the digit for the special ASCII characters per 8.2.11.2, which you explained so well.

Howard Richey
Sterling, Illinois

To the Editor:

In reference to the letter on printer codes (December/January 1985/86 *Power/Play*), I would advise trying each Commodore key preceding a group of letters and ending with the adjacent Commodore key or, turning the printer off after each print sequence.

As a result, I am able to direct a code in any of three formats: F1 ↑ (escape), defining a sequence, or Commodore key. As an example, the expanded mode is turned on by Commodore-C and turned off by Commodore-V.

I hope this will be helpful.

Anthony Tamburro
Broomall, Pennsylvania

To the Editor:

I have been using *Easy Script* for nearly two years and, although I have tried other word processors with my 64, I always return to *Easy Script*. I made several discoveries regarding printer commands and would like to share them with you and your readers who have similar problems.

Printer commands are really quite simple. I have two 64's: One is connected to an Epson RX-80F/T via a Micrografix MW-302 interface, and the other is connected to an Epson FX-85 via a Micrografix MW-350 interface. Friends of mine here at the American Embassy in Brasilia are using Star Micronics' Gemini-10X and SG-10 printers with a variety of interfaces and they report that these commands all work.

Instead of entering the F3 format mode, use the F1 (for edit mode) key, either alone or in conjunction with the up-arrow key. The up-arrow key acts as an escape key. (See Table 1.)

It is rather simple to switch from one of these modes to another, or to mix them together. The F1 key, followed by usually one, or sometimes

Continued on pg. 6

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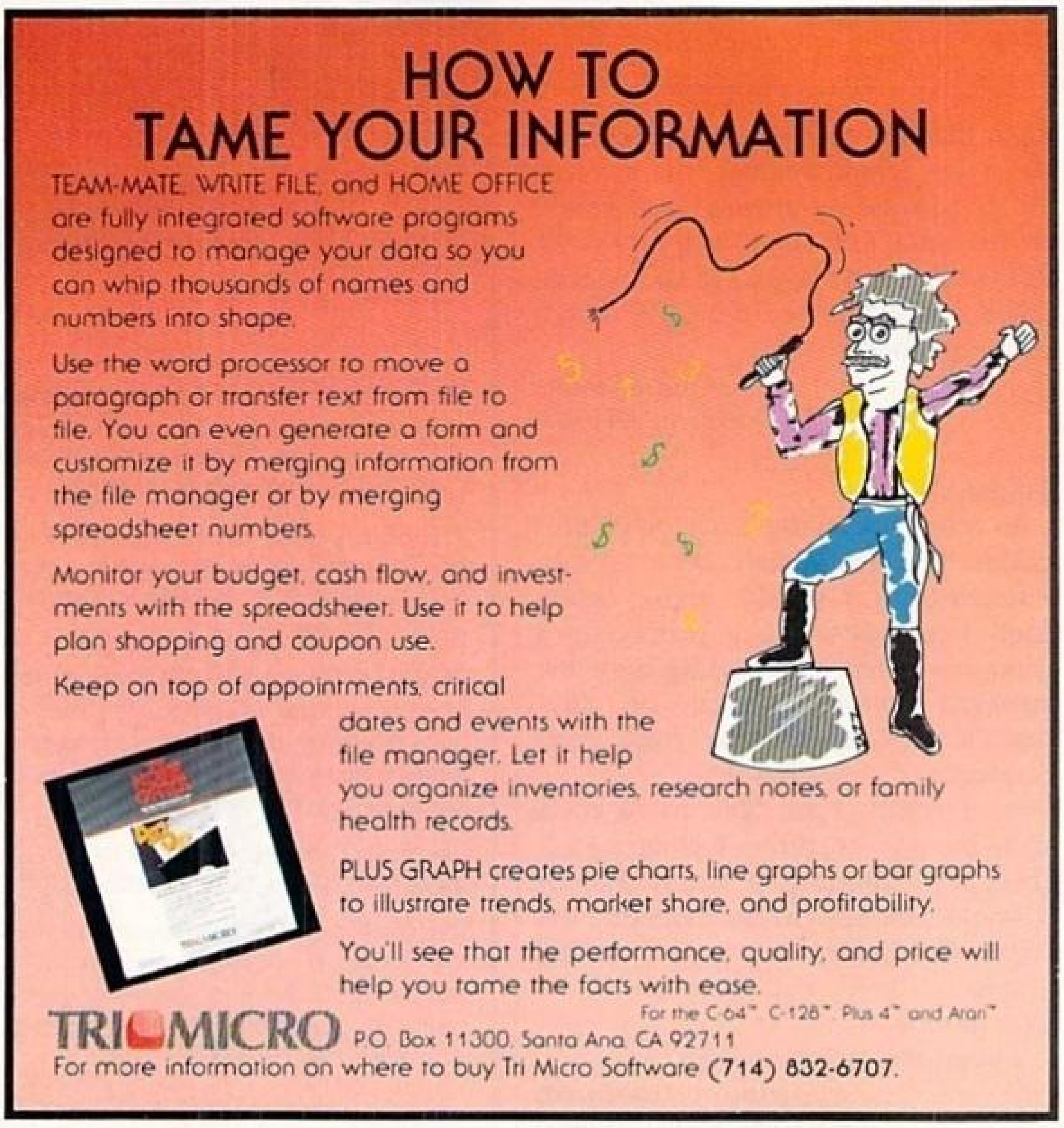

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two other keys, should allow the *Easy Script* user to vary the print quickly and easily.

Robert Arceneaux
American Embassy, Brasilia, Brazil

To the Editor:

In the letters section of the December/January 1985/86 *Commodore Power/Play*, there was a letter asking about special printer codes in *Easy Script* using the ASCII codes. You provided a partial answer pertaining to the Gemini printer.

I have a Gemini-10X printer and have been very frustrated with my inability to get the printer to produce the various pitches and fonts from within the *Easy Script* program. My user group provided a partial answer that I have been able to adapt to the Gemini-10X with Card? + G interface, following the general lines you mentioned in your answer. Maybe some others of your readers would be interested.

The *Easy Script* control codes on page eight through nine of the program manual work only for the first two commands when you are using a Gemini-10X—Enhance and Reverse. The rest do not work. To get emphasized type, double strike, italics, elite condensed, enlarged, superscript and subscript types, and underlining, type in the control line specified in Table 2 somewhere in the heading group of the *Easy Script* document. The program is then prepared to print the special type fonts.

Charles R. Wallis
Deerfield, Illinois

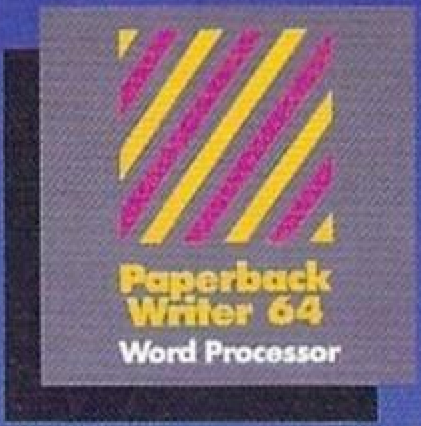
To the Editor:

The response to Mr. Brooks' letter in the December/January 1985/86 *Commodore Power/Play* explaining how to send ASCII characters to the printer from *Easy Script* is correct, but it ignores the printer interface. Non-Commodore printers must be interfaced to the computer, and in some cases the interface interferes with the printer's interpretation of escape sequences and ASCII codes. For example, Tymac's "The Connection" interprets escape sequences as commands for the interface, and therefore does not pass them on to the printer.

There are two possible ways

Continued on pg. 8

Solutions!



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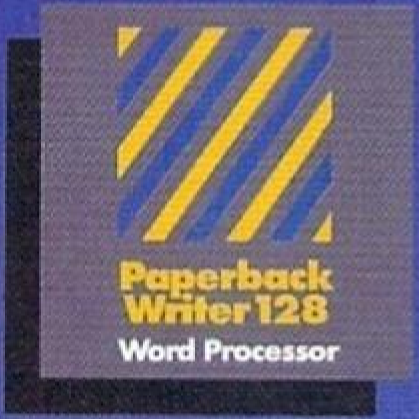

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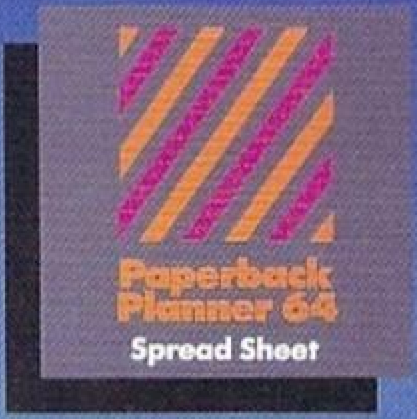

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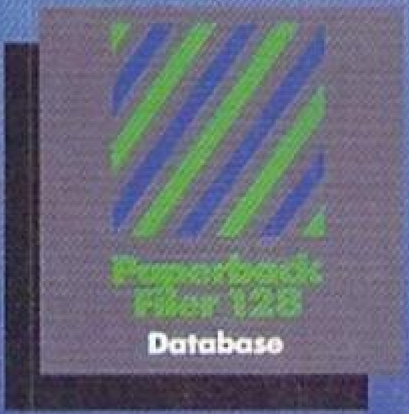

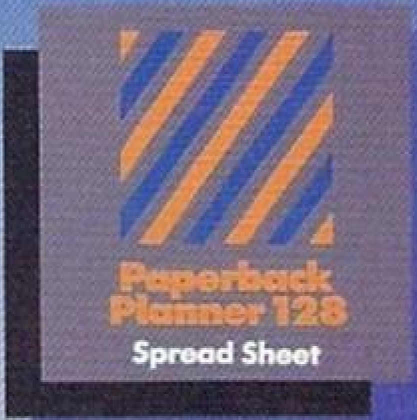

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aperback Writer 128 and 64 are now available in Frenc around the problem, depending on the interface. First, if it is possible to put the interface into transparent mode, the interface will no longer interpret the escape sequences and printer commands. It will just send them to the printer. However, the interface will also not make the translation between Commodore ASCII and standard ASCII, so your printed text will come out with upper case and lower case reversed, inclusion of italics, or other anomalies.

The way around this side effect is to tell *Easy Script* that the printer is a standard serial printer, not a Commodore printer. Hit the appropriate code (not "1") on the title screen of *Easy Script*, then answer "s" for serial printer. If you do that *and* have the interface in transparent mode, the escape sequences and printer commands will work as described in the response to the letter. Consult your interface instruction manual to find out how to put your interface into transparent mode. Some use software methods, some use hardware (switches) methods, and some use either.

The second way to get the escape sequences and printer commands to the printer through a "smart" interface may be outlined in the interface instruction manual. In some cases, a special code tells the interface that the command is really for the printer. Again, in the case of The Connection, sending two escape characters in a row tells the interface to pass the command on. The first escape alerts the interface that the next character is a command for the interface, not a character to be printed. The second escape tells the interface that the command is for the printer, and not the interface. Again, consult the instruction booklet for your interface in order to learn just how to train *your* interface to do your bidding.

In general, it's a great idea to reread an instruction manual after you have been using a program or piece of equipment for some time and after you consider yourself an "expert." Most people use only a portion of the features of a complex program or piece of equipment because they didn't have need for some of the advanced features and have since forgotten that they exist. Re-reading instruction manuals has always provided me with several new features that I had wished were available.

Stephen Leven
Randallstown, Maryland

Table 1.

F1/[	Underline or expand text. End with F1/] (varies with different printers).
F1/(	Bold or reverse text. End with F1/).
F1/&	Double-strike or inverse text. End with F1/%.
F1/'	Enter superscript (once for each character).
F1/,	Enter subscript (once for each character).
F1/;	Underline or bold text. End with F1/: (varies with different printers).
F1/<	Condensed mode. End with F1/>.
F1/↑/4	Italics. End with F1/↑/5.
F1/↑/M	Elite mode. End with F1/↑/P (capital "M" and "P").
F1/↑/p1	Proportional spacing. End with F1/↑/p0.

Table 2.

F3/0=0:1=1:2=2:3=3:6=98:7=119:8=115:9=45

Interface-based codes:

F1/↑/E	Cancel: F1/↑/F	Emphasized
F1/↑/G	Cancel: F1/↑/H	Double Strike
F1/↑/4	Cancel:F1/↑/5	Italics
F1/↑/F1/6/F1/1		Pica type
F1/↑/F1/6/F1/2	Cancel:F1/↑/F1/6/F1/1	Elite type
F1/↑/F1/6/F1/3	" "	Condensed type
F1/↑/F1/7/F1/1	" "	Enlarged type
F1/↑/F1/8/F1/0	Cancel: F1/↑/T	Superscript type
F1/↑/F1/8/F1/1	" "	Subscript type
F1/↑/F1/9/F1/1	Cancel:F1/↑/F1/9/F1/0	Underline

Standard Easy Script codes:

F1/[	Cancel: F1/]	Enhanced type
F1/(	Cancel: F1/)	Reversed type
F1/%	Cancel: F1/%	Shadow type
F1/!	Cancel: F1/"	Red or condensed type
F1/' (each character)		Superscript type
F1/, (each character)		Subscript type
F1/;	Cancel: F1/:	Bold type

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Anatomy Aid

Inside Story—The Anatomy Learning System from Access Software has been released for the Commodore 64/128. **Inside Story** lets you explore the inner workings of the human body and view specific organs or body parts. Fifty high-resolution screens illustrate the body's components and how they work. You can test your knowledge of human anatomy with multiple-choice quizzes and final exams. Scores may be printed or saved to disk, and control is by either keyboard or joystick.

Inside Story retails for $34.95. (Access Software, 2561 South 1560 West, Woods Cross, UT 84087)

Mach 5 Upgrade

The **Mach 128** fast-disk package, which speeds up the operation of the Commodore 1541 and 1571 disk drives, has been released for the Commodore 64 and 128 by Access Software. The cartridge plugs into the expansion port of either machine and may be left in place at all times. Upon power-up, the cartridge automatically senses whether a 1541 or a 1571 disk drive is connected to the system and which mode the computer is in. **Mach 128** then engages or disengages the drive speed routines. The DOS enhancements are resident and active in the 64 and in all three of the 128 modes—40-column, 80-column and 64 emulation.

When using a 64 (or 64 emulation on the 128) with a 1541 or 1571 disk drive, programs load up to five times faster. When using a 128 (in 128 mode), programs loading from a 1541 will load up to five times faster and programs loading from a 1571 will load at burst speed. There is a mode selection switch on the cartridge for selecting either native 128 or 64 emulation mode. A reset switch is also provided on the cartridge body for "warm starts" of the system without turning the computer off and on again.

In addition to the **Mach 128** cartridge, a disk containing several other 64-mode programs is also included. A disk organizer and catalog program, two monitors, and a BASIC +4 program for an added four kilobytes of transient memory area in the BASIC workspace are included.

Mach 128 carries a suggested retail price of $49.95. (Access Software, 2561 South 1560 West, Woods Cross, UT 84087)

Macintosh Environment on the Commodore 64

Berkeley Softworks has released GEOS (Graphic Environment Operating System) for the Commodore 64, a graphic iconic user interface that features icons, pull-down menus, and windows. GEOS also increases the speed of the 1541 up to seven times.

GEOS includes three utility packages: GEOS Desktop, geoPaint, and geoWrite. GEOS Desktop lets you run, copy or delete files with a joystick or mouse, and includes an alarm clock, notepad, photo and text album, and a calculator. GeoPaint creates charts or diagrams, and geoWrite is a word processor that features different font styles.

GEOS has an introductory price of $59.95 through May 31st. (Berkeley Softworks, P.O. Box 57135, Hayward, CA 94545)

Professional CAD Package for the Amiga

Aegis Development Inc. has released **Aegis Draw**, a Computer Aided Design (CAD) software package for the Amiga. The program will work in several graphics modes, and gives the user the option to work on several drawings at the same time. Multiple colors, structured shapes, and auto-dimensioning are also included. Complete plotter support is provided along with the ability to print hardcopy. **Aegis Draw** retails for under $200. (Aegis Development, 2210 Wilshire Boulevard, #277, Santa Monica, CA 90403)

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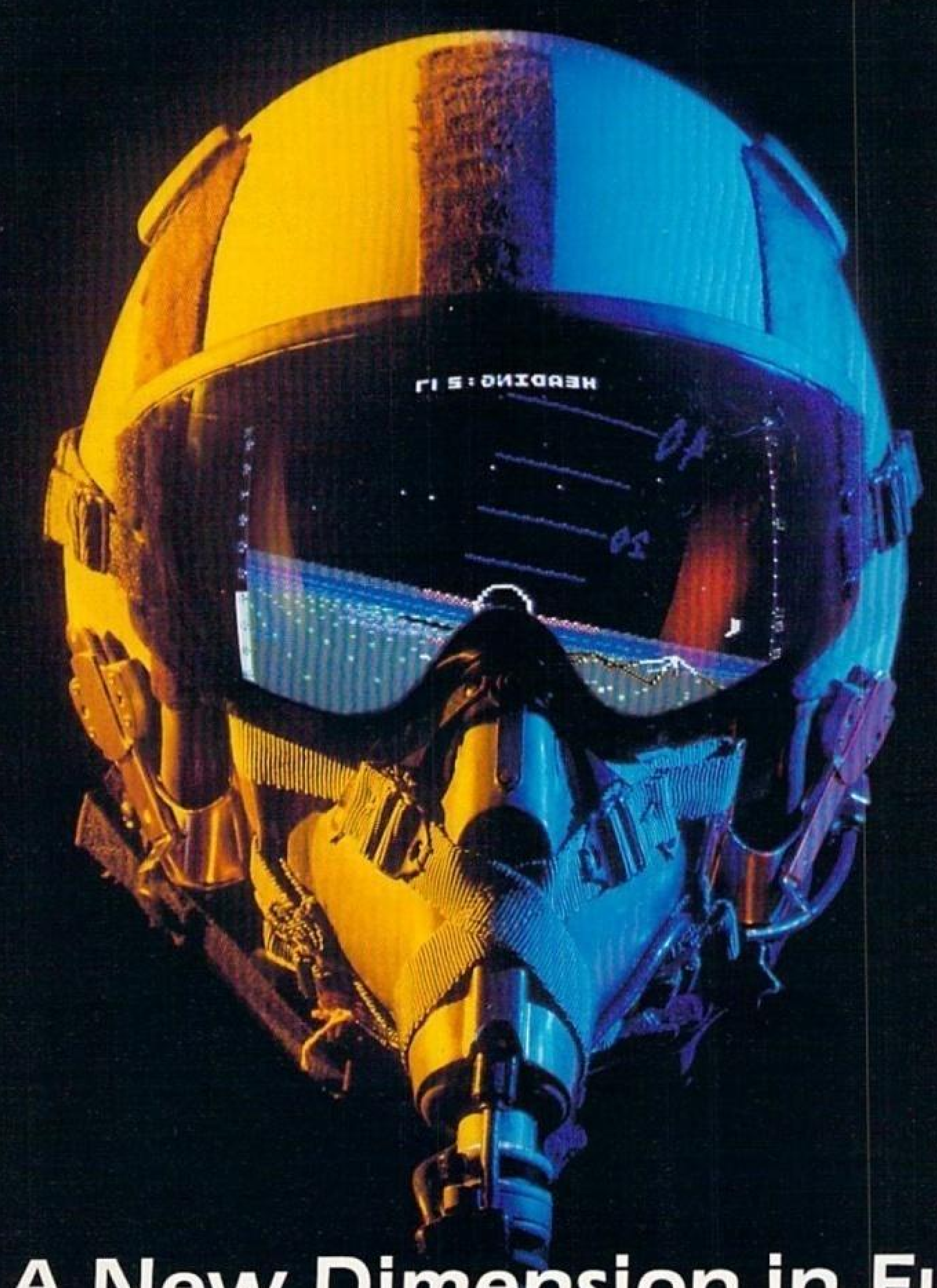

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COMMODORE'S NEWS FROM THE FRONT

SkiWriter Price Reduction

Mastertronic has announced a price reduction of **SkiWriter**, a word processing program for the Commodore 64 previously published by Prentice Hall. **SkiWriter** is now available for $14.95. The program is identical to the original, except it no longer contains telecommunications capabilities. (Mastertronic, 7311B Grove Road, Frederick, MD 21701)

Music Studio for the Amiga

Activision has released **The Music Studio** for the Amiga. **The Music Studio** is a music composition tool previously available for the Commodore 64/128. The Amiga version features pull-down windows and editing functions which include commands to move, copy, repeat and transpose. Complete musical notation includes time signatures, ties, rests, measure bars, sharps and flats.

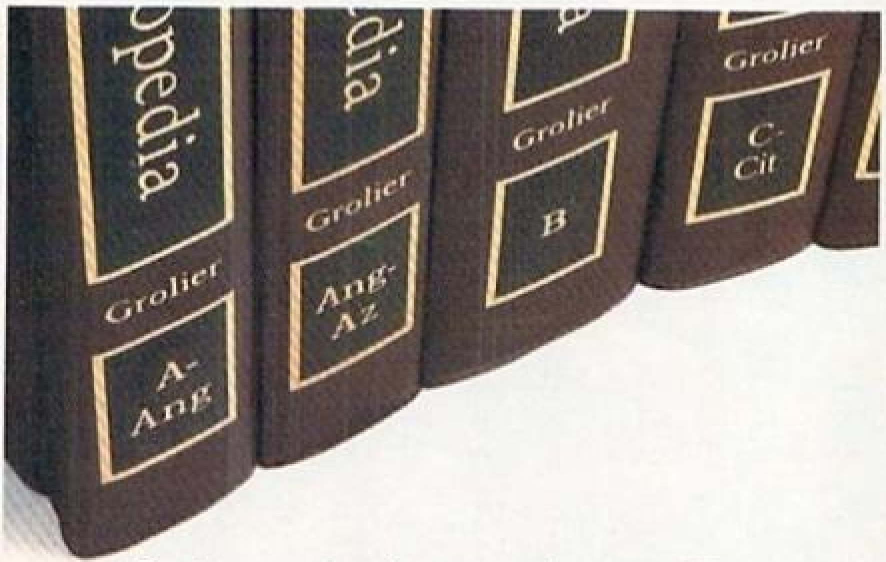
The Music Studio for the Amiga is powerful enough to work with MIDI musical keyboards in stereo. It creates musical scores with up to 16 MIDI channels controllable at the same time. A "sound board" feature allows musicians to design instruments or create new sound effects.

Retail price was unavailable at press time. (Activision, 2350 Bayshore Frontage Road, Mountain View, CA 94043)

Pro Golf Simulator

Access Software has released **Leader Board**, a golf simulator for the Commodore 64/128. Its features include multiple 18-hole courses, three-dimensional animation, and three levels of play. Also included are computerized scoring, a handicap system, and strategy decisions of club, distance and other variables.

Leader Board retails for $39.95. (Access Software, 2561 South 1560 West, Woods Cross, UT 84087)



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Control Your Home for Less

X-10 Inc. has announced a price reduction of the X-10 Powerhouse home control system for the Commodore 64 and 128. The Powerhouse system, which includes the interface, software and connecting cables, now costs $49.99.

The X-10 Powerhouse interface is cable-connected to the Commodore user port and plugged into a standard 110V outlet. After it is programmed, the interface sends digitally encoded signals through your home wiring to special X-10 modules. To control a lamp or appliance, for instance, you simply plug the electrical device into a module and then plug the module into an outlet. The interface can control up to 256 modules throughout your home and won't interfere with normal use of lights and appliances. Modules cost less than $20 each. (X-10 Inc., 185A Legrand Avenue, Northvale, NJ 07647)

Learn to Type

Tymac has released **Type-Snyper**, a typing game that features an attack helicopter that drops bundles of words and letters that must be destroyed by typing them. Sixteen exercises make learning to type fun as well as challenging, with lessons that range from proper finger placement to increasing speed and accuracy. **Type-Snyper** automatically adjusts exercises to emphasize areas needing extra help. **Type-Snyper** is one of the Tymac Talkies, software-generated talking games, available for the Commodore 64 on disk or tape. Retail is $39.95. (Tymac Controls, 127 Main Street, Franklin, NJ 07416)

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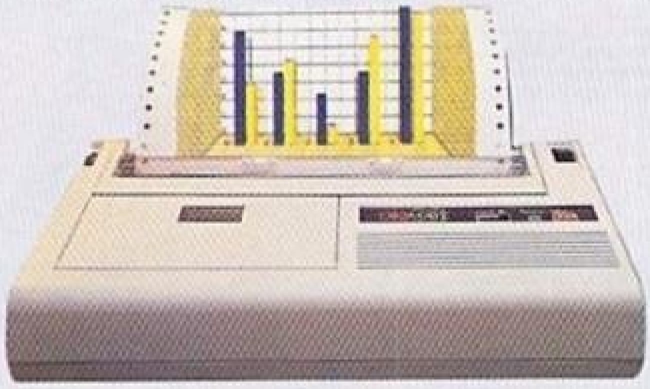

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POWER PLAY'S NEWS FROM THE FRONT

Graphic Arts Programs for the Amiga

Aegis Images and **Aegis Animator** for the Amiga have been released by Aegis Development Inc. **Aegis Images** is a professional paint program and **Aegis Animator** is an animation and storyboard program.

Aegis Images features high and low resolution; the use of 32 colors at one time; spread and wash options for definition; dithering (automatic color blending); cycling of up to four groups of colors at one time; grids for detailed drawing; adjustable airbrush; customizable paintbrushes; tile drawing; and a convenient "fast menu" for easy access.

Aegis Animator allows any **Images** pictures to be a backdrop for an animated sequence, as well as path plotting; storyboarding of up to nine separate animations; clone and destroy for copying and eliminating animated objects at random; movement on x and y axis for a three-dimensional effect; full rotation; proportional sizing; metamorphic object changes; and a ghost (outline) mode.

Both programs retail for $139.95, and **Images** retails for $79.95 alone. (Aegis Development, 2210 Wilshire Boulevard #277, Santa Monica, CA 90403)

Actionauts Phone Number Correction

In the February/March issue of **Commodore Power/Play**, we ran a news item titled "Free Robot Software," in which we provided a telephone number for acquiring **Actionauts** software via modem. As many of you may have discovered, the phone number for the APT Bulletin Board was wrong. (This was because of a mix-up with Ma Bell, not a misprint.) If you're still interested in downloading the **Actionauts** robot software from the APT board, call: 415-322-3213.

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Attendance Program for the PET

The Attendance Secretariat, a program from Bultman Educators' Software, features a "Bloodhound Report" which keeps track of a student's attendance history and checks it against a pattern.

Daily reports include Students Absent, Students Excused, Excessively Absent Students, and Excuse Slips. Attendance summaries by grade and date are also available. Other features include marking an entire class excused, advancing and removing students at the end of the year, and student lists.

The package includes a 95-page manual and a two-hour video tutorial. Preview disks and a 15-page introduction are available for $10. The program works with the 4032, 8032 or SuperPET with a 4040 or 8050 drive and all printers. The program retails for $195. (Bultman Educators' Software, 5175 Wallingford NW, Comstock Park, MI 49321)

Programmers' Toolkit

Epyx's **BASIC Toolkit** for the Commodore 64/128 gives programmers assembly-language power and speed using simple BASIC commands. Over 100 new BASIC commands allow Commodore owners to add high-speed assembly-language operations to their application programs. **BASIC Toolkit** boosts the Commodore operating system as well, with features such as a directory listing command, straightforward disk command syntax, and a LOAD/SAVE function for graphics, sprites and character sets. It also prints disk catalogs, text files and program listings in BASIC. Retail price was not available at press time. (Epyx, 1043 Kiel Court, Sunnyvale, CA 94089)

More news on pg. 127

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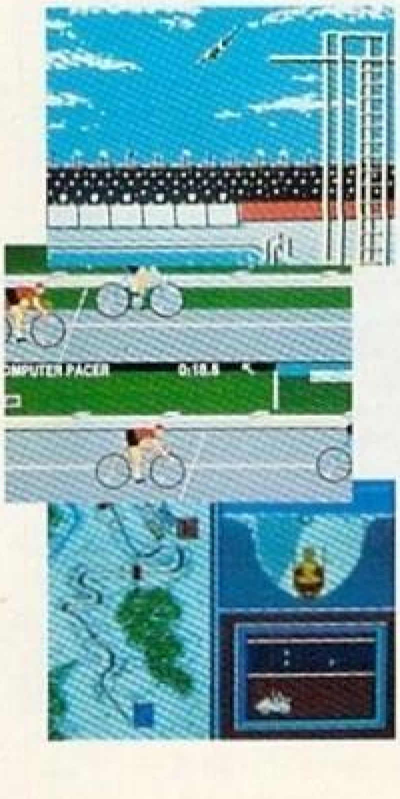

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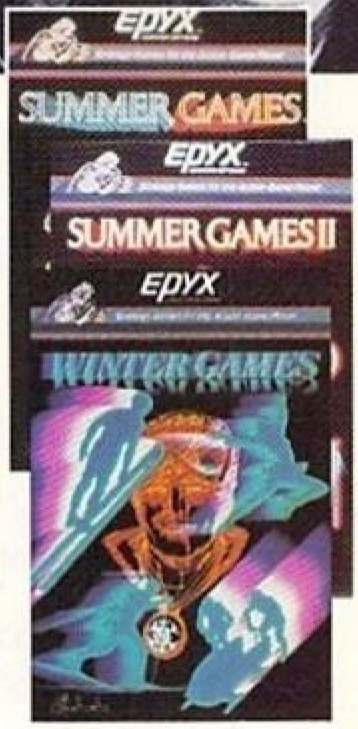

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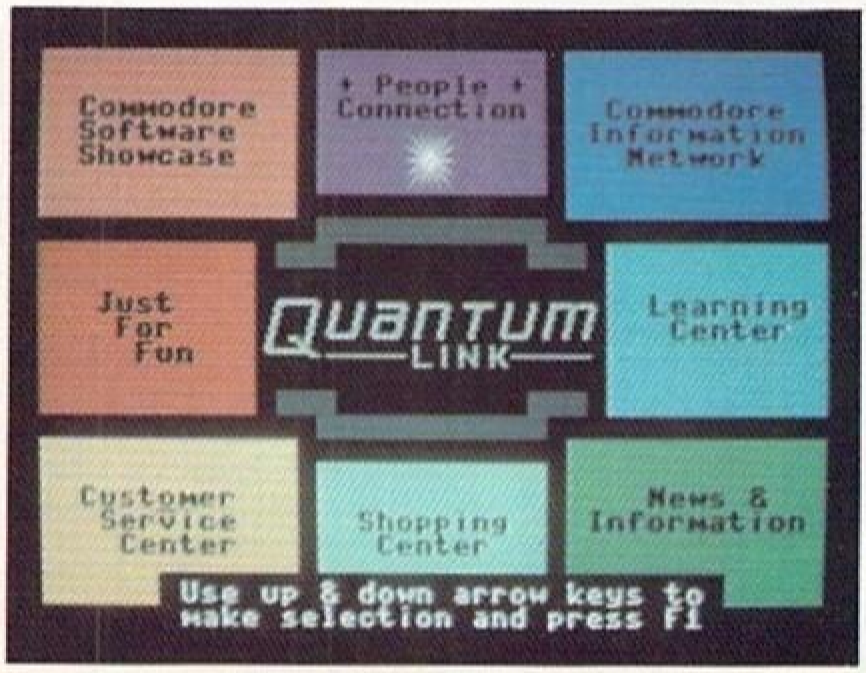
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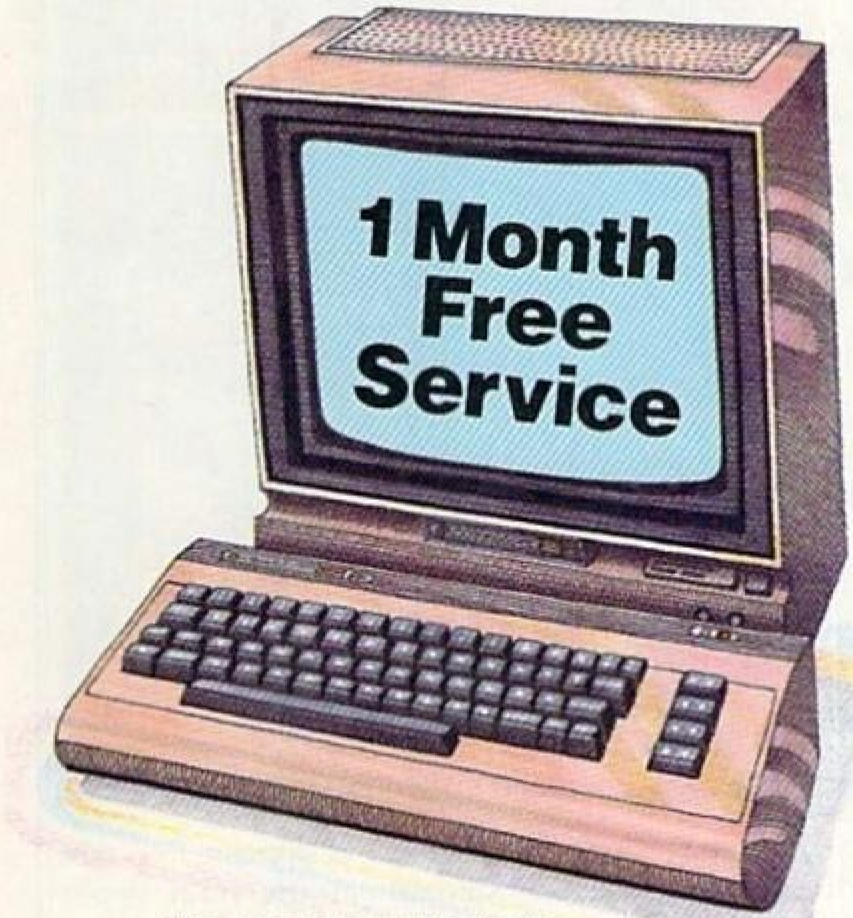

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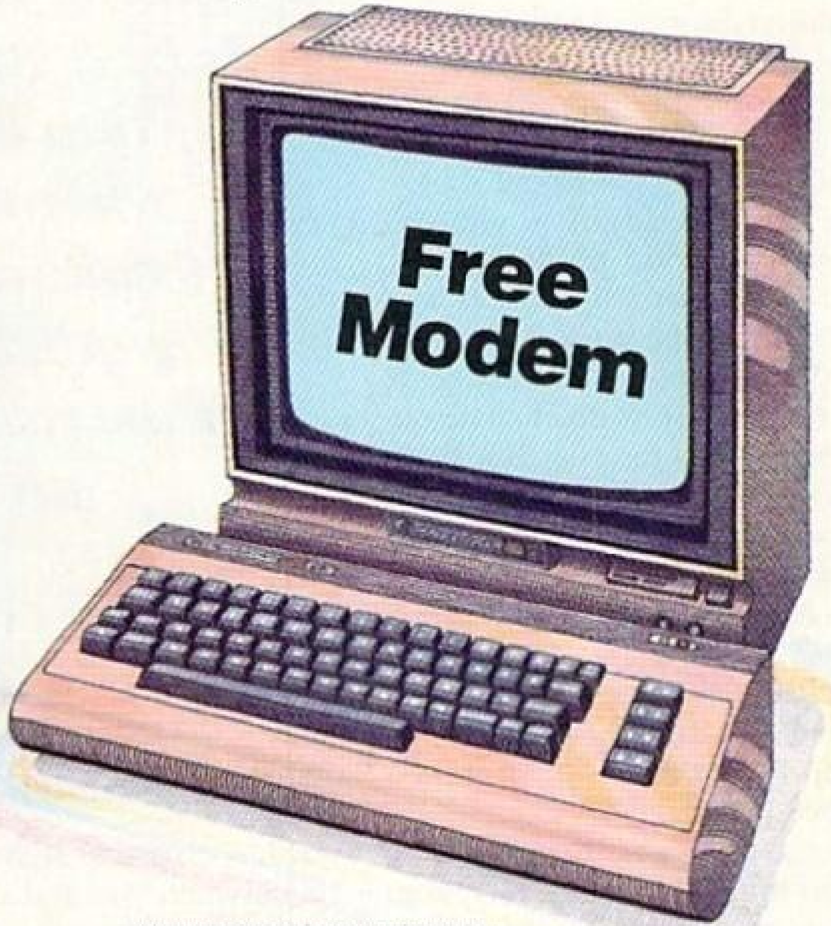

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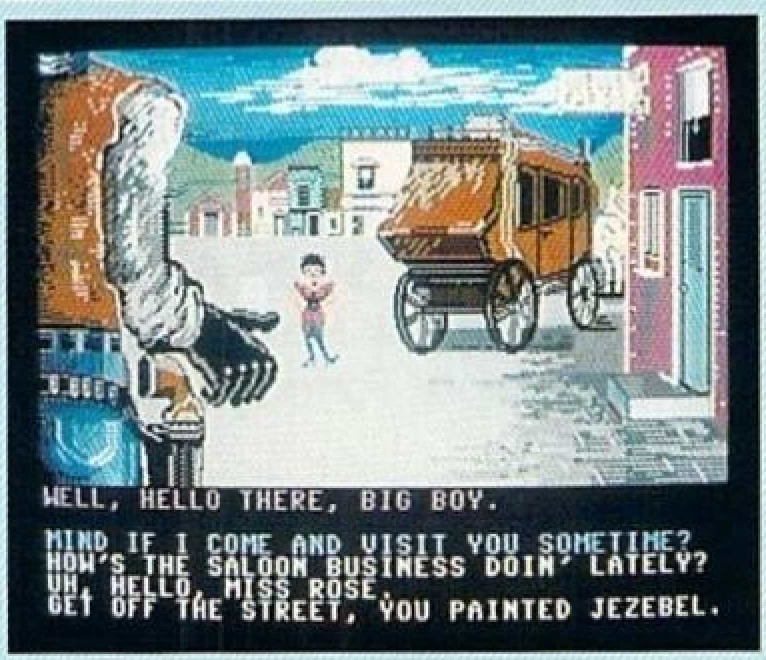
REVIEWED BY ERVIN BOBO

Law of the West

Computer: Commodore 64
Publisher: Accolade
20863 Stevens Creek
Boulevard
Cupertino, CA 95014
Medium: Disk
Price: $29.95

Someone walks into the street and confronts you. Is he a good guy or a bad guy? You must decide, and decide quickly, for the risk is death.



```
WELL, HELLO THERE, BIG BOY.

MIND IF I COME AND VISIT YOU SOMETIME?
HOW'S THE SALOON BUSINESS DOIN' LATELY?
UH, HELLO, MISS ROSE.
GET OFF THE STREET, YOU PAINTED JEZEBEL.
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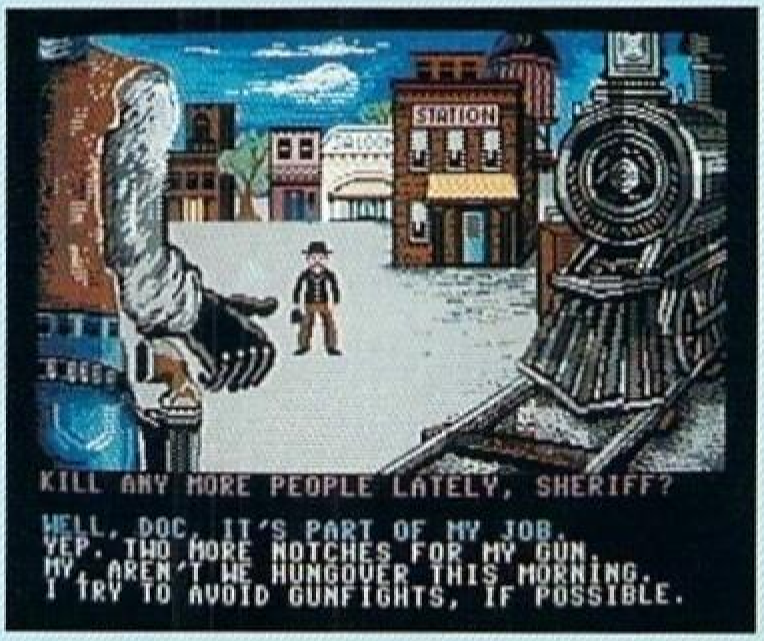

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KILL ANY MORE PEOPLE LATELY, SHERIFF?

WELL, DOC, IT'S PART OF MY JOB.
YEP. TWO MORE NOTCHES FOR MY GUN.
MY, AREN'T WE HUNGOVER THIS MORNING.
I TRY TO AVOID GUNFIGHTS, IF POSSIBLE.
```

When the editorial old-timers gather 'round the campfire to spin yarns about the best games of '86, *Law of the West* better be near the top of the list—or somebody's gonna get shot.

You're the sheriff of a western town, making your daily rounds. Someone walks into the street and confronts you. Is he a good guy or a bad guy? You must decide, and decide quickly, for the risk is death. The object of the game is for you to make it to sundown.

Game screens, finely detailed and drawn by real artists, give you a perspective reminiscent of the opening scenes of the old TV show, Gunsmoke. Although you are the sheriff, your viewpoint is from behind him, with your eyes at the level of his holstered revolver.

Because *Law of the West* is paying homage to the Old West, I don't mind that it is peopled by stock characters. The difference comes when the doctor, Mexican bandit, saloon girl, and schoolmarm don't act as you'd expect. Each character, besides having a unique entrance theme, has a personality that may or may not jibe with appearance.

The bottom one-third of the screen is reserved for dialogue, and your adversary always speaks first. His remark may be provocative, taunting, or friendly. You must choose your reply from four possible replies. Joystick selection makes it quick. Because the game is a large data base of dialogue and consequences, the action may never happen the same way twice.

You've replied, he's replied, and one thing has led to another, and it seems this waddie is spoiling for a fight. If that is your decision, draw your gun by pushing the joystick forward. A crosshair sight appears in the air between you and your foe. Line it up on him, press the fire button and he falls dead in the street—unless he gets you first.

But was your decision correct? You won't know until the game is over and you read the screen that grades you on how well you maintained authority, how you did romantically, how many bad guys you jailed, how many bad guys you killed—and how many innocent citizens you killed.

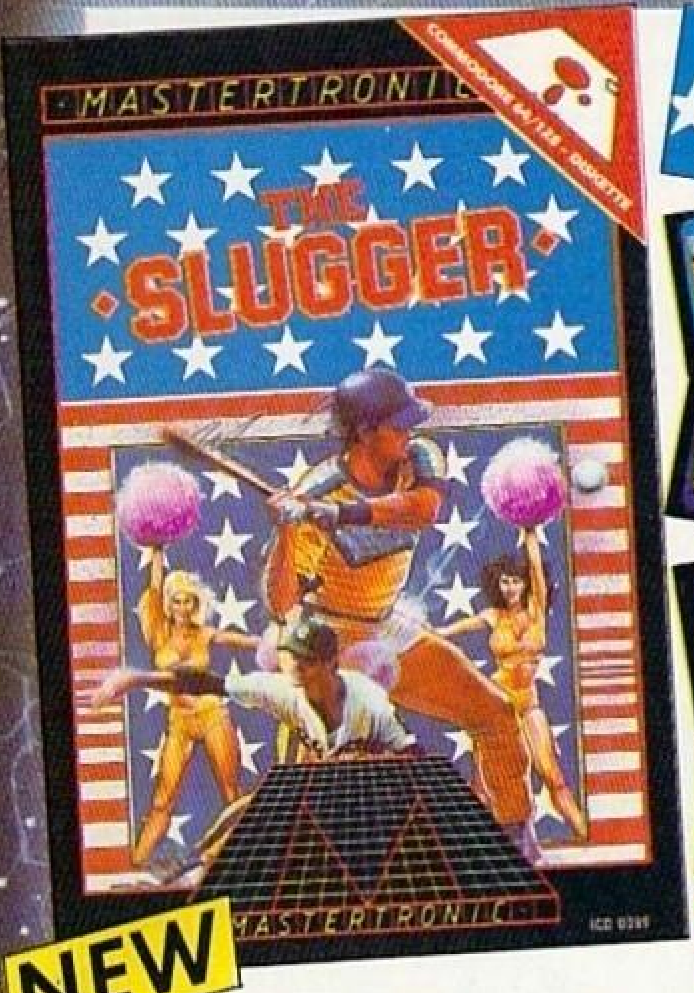
On the other hand, if you smooth him down and let him walk away, he may go off and commit a crime. Again, you won't know this until you see your scorecard.

As you make your rounds through the town, a smooth, movie-like dissolve takes you from one screen to another and does it quickly enough that there is no delay. Because a random factor controls the characters, the screen before you offers no clue as to who will next appear. I've met the schoolmarm at the train depot and met her coming out of the saloon.

Should you get shot, the screen darkens and lines of dialogue appear. The doctor is summoned, but you may or may not recover. The screen darkens because you are only semiconscious, but you are still able to hear the noises of the crowd gathered around you. Like everything else in the game, it works well.

I am not surprised that a game so deserving of superlatives is one of the first efforts of a new company. Designer Alan Miller was responsible for many games for the Atari VCS and was co-founder of Activision. I have only admiration for the play value and a profound respect for the execution. Miller has been around long enough to have learned that it takes excellence to succeed in the gaming business. In *Law of the West*, he has used everything he's learned.

THERE'S NO BEATING ·MASTERTRONIC·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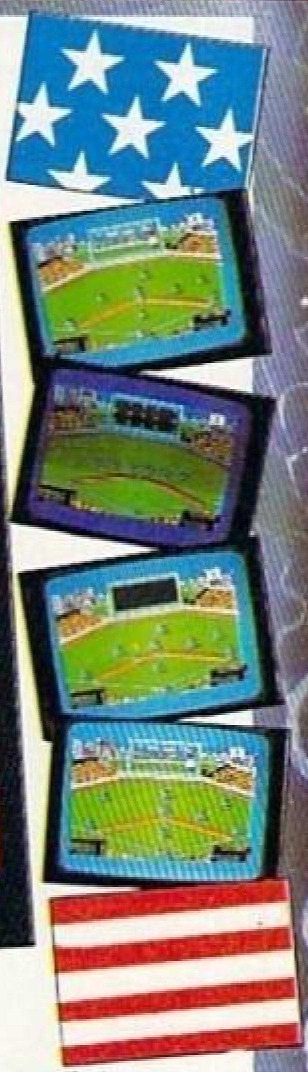

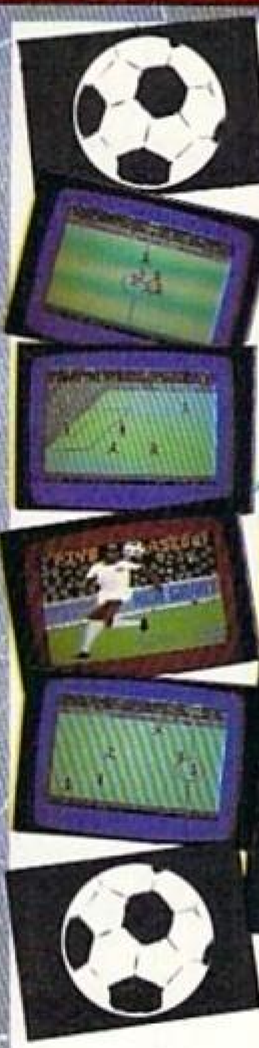

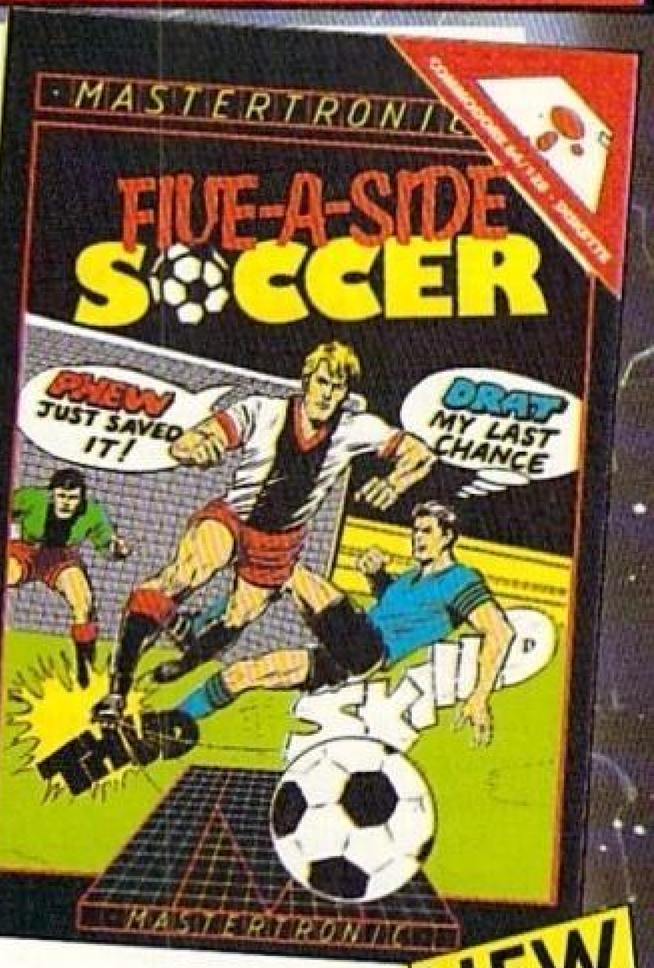
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FIVE-A-SIDE SOCCER
PHEW JUST SAVED IT!
DRAT MY LAST CHANCE
THUD
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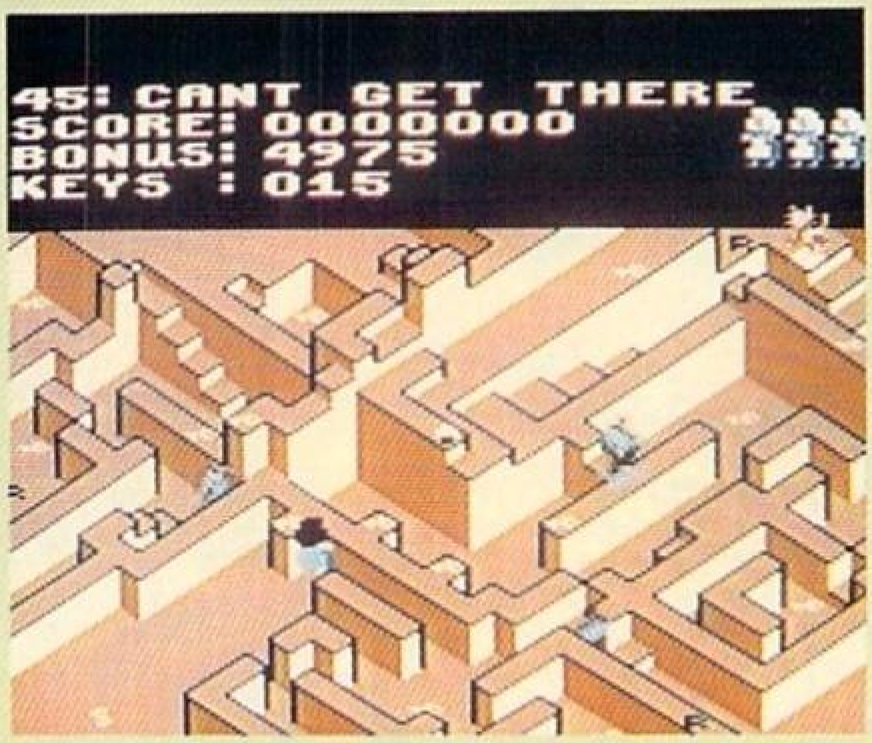
REVIEWED BY ERVIN BOBO

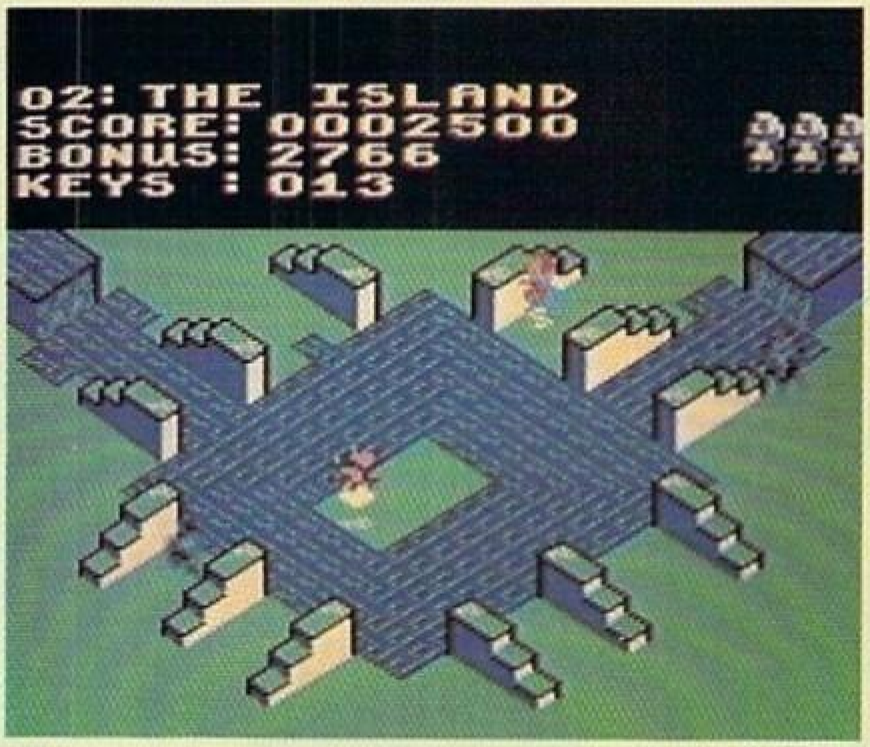
Lode Runner's Rescue

Computer: Commodore 64
Publisher: Synapse/Broderbund
17 Paul Drive
San Rafael, CA 94903
Medium: Disk
Price: $29.95

The mazes in Lode Runner's Rescue *are among the most devious ever constructed for a computer: 3-D mazes with ups and downs as well as in's and out's.*



45: CANT GET THERE
SCORE: 0000000
BONUS: 4975
KEYS : 015



02: THE ISLAND
SCORE: 0002500
BONUS: 2766
KEYS : 013

Ever wonder what happened to the Lode Runner after he completed the 150 levels of the first game and the added levels of *Championship Lode Runner*? Well, after all that running, jumping and climbing, he was captured by Synapse, minions of the evil Bungeling Empire, and is being held prisoner in a maze game called *Lode Runner's Rescue*.

As Alexandra, daughter of the Lode Runner, you must traverse 46 mazes and collect all the keys in all the mazes to rescue him. Simple enough, right?

Wrong. The mazes here are among the most devious ever constructed for a computer: 3-D mazes with ups and downs as well as in's and out's, each more difficult than the last.

As if that weren't enough, you must also catch the Magic Cat (actually, you must step on him). Like any cat, he prefers not to be stepped on, tending to frisk about just out of reach. And, of course, you must do all this under the watchful eyes of the Bungeling guards who patrol each maze. Bump into a guard and you lose a life.

Don't look for ladders, or bars either, for that matter. After all, the bad guys chased the Lode Runner through too many of those and they know that he can negotiate them well. Therefore, they have set new hazards to keep the Lode Runner in, but not good enough to keep his daughter out. Alexandra has different talents.

Alexandra is an excellent swimmer, so long as she doesn't try to swim against the current. She is also good at hiding and jumping. In fact, if she steps on a magic mushroom, she grows taller and stays that way for a short time. And with longer legs, she can jump twice as far.

No opportunity for a maze is overlooked. Even the title screen is a maze that must be negotiated before you can go on to the game. If you think the 46 mazes provided are too easy, you may edit them. Pressing F7 at any time takes you into the edit screen where you can select any of the mazes and alter it as you see fit. However, you can only make them tougher.

F5 will allow you to select any maze for testing purposes, so if you can't make it through level three and you're just dying to know about level fifteen, this is your chance for a preview. But what you do in the test mode does not contribute to your total game score, nor will that option allow you to skip to the endgame screen and rescue the Lode Runner. You're going to have to do it the hard way.

Graphics in the game are as good as any you've seen and, because they are three-dimensional, better than most. Rather than running complicated paths, as in *Pac-Man*, your mazes here consist of buildings, pedestals, streams and islands. Hazards abound.

Sound is fair, limited to the bleeps and blurps usually found in arcade-type games, and joystick control is a little strange. Synapse recommends holding the stick diagonally, to correspond to the slant of the screen, but even that will take some practice.

You don't have to know anything about the original *Lode Runner* games to enjoy *Lode Runner's Rescue*. In fact, the only connection is the title. But if you enjoy mazes, then go with Alexandra on her mission and drive yourself crazy.

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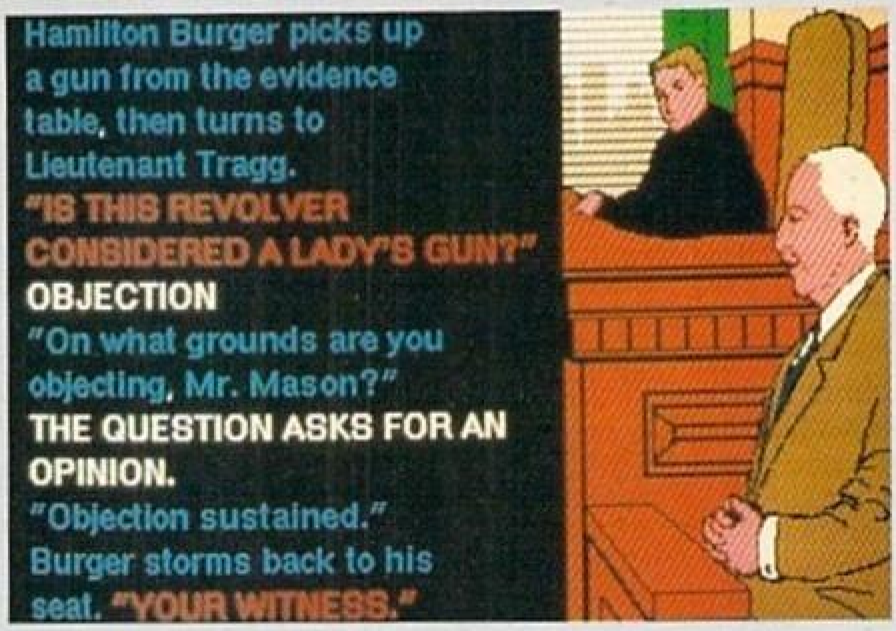
REVIEWED BY GARY FIELDS

Perry Mason:
The Case of the Mandarin Murder

Computer: Commodore 64
Publisher: Telarium
Spinnaker Software
One Kendall Square
Cambridge, MA 02139
Medium: Disk
Price: $32.95

As Perry Mason, you must dig up enough evidence to not only prove your client's innocence, but finger the murderer as well.



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Hamilton Burger picks up
a gun from the evidence
table, then turns to
Lieutenant Tragg.
"IS THIS REVOLVER
CONSIDERED A LADY'S GUN?"
OBJECTION
"On what grounds are you
objecting, Mr. Mason?"
THE QUESTION ASKS FOR AN
OPINION.
"Objection sustained."
Burger storms back to his
seat. "YOUR WITNESS."
```

If names like Perry Mason and Della Street conjure up drama, mystery and suspense, you are ready for *Perry Mason: The Case of the Mandarin Murder*, a text adventure from Spinnaker's Telarium series.

Laura Kapp, a woman recently released from a mental institution, has been arrested for the murder of her estranged husband Victor, owner of the Mandarin restaurant. The case against Laura is tight: She had a motive (Victor wanted a divorce), and she was arrested at the crime scene with the still-smoking murder weapon by her side. She says she didn't do it, and you as Perry Mason believe her. With the aid of your assistant Paul Drake, you must dig up enough evidence to not only prove Laura's innocence, but finger the real murderer as well. Then with Della's aid, you must present the case in court.

As Mason, your job is to collect evidence to introduce in court. But your ability to argue and prove legal points is also important. You have to know what to do with the items you find and how to connect the pieces of a legal puzzle. You must combine timing, facial expressions and legal maneuvers to prove your points to Judge Northrup and influence the jury. It is not enough to merely investigate the case and analyze the facts.

The game comes with a 12-page "Lawyer's Handbook." It includes hints on investigating the case, how to use Drake and Street effectively, examination procedures, and suggestions on courtroom theatrics. This is the first game I've seen that lets you smile, sneer, or curse to influence the jury or intimidate a witness.

You can always object to Prosecutor Burger's questioning of a witness, but you must know upon what grounds. Failing to supply a legal objection makes Judge Northrup overrule your objection.

The game's command vocabulary is just under 1,200 words. Because of this, the game may not understand synonyms. To get places, you don't need commands like "go north" or "go south." Instead simply say "go to apartment." The challenge is not so much finding locations, but observing them and making connections.

Build your case on evidence and don't jump to conclusions. Jumping to conclusions can result in some odd responses. For instance, if you ask the doorman, "Did you kill Victor?" he will respond "I don"t know. I'm just a doorman." Not exactly the response you would expect from a person on the witness stand.

The Case of the Mandarin Murder has two unexpected features: sound and graphics. Detailed musical scores set the atmosphere, and the game offers an option for graphics displays. Since the bit-map graphics are called into the computer's memory by accessing the disk, there is a short wait while the disk spins. But because the displays are well done and in some cases supply clues, I suggest you endure the wait and enjoy the pictures. Since these graphics are an option, they can also be turned off.

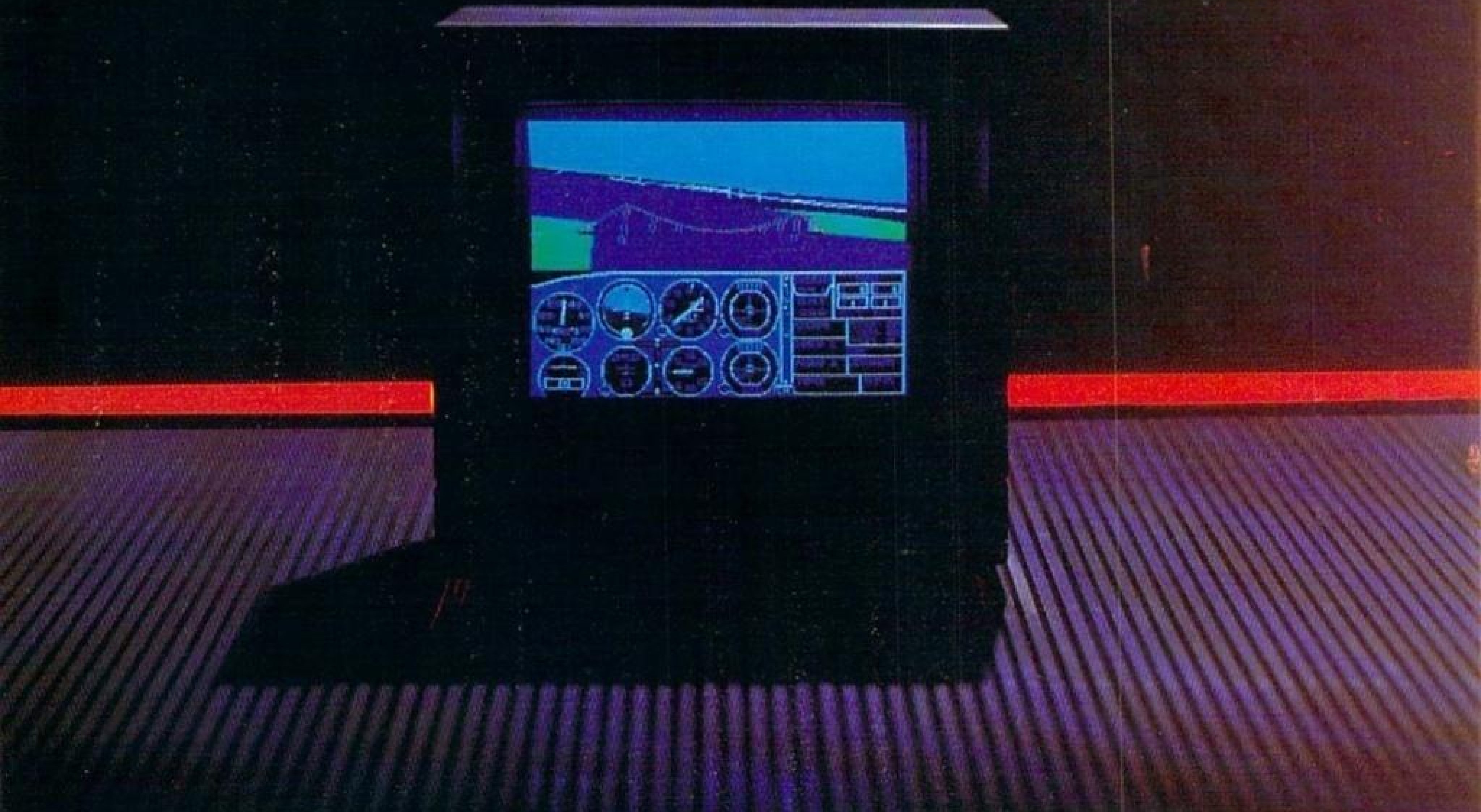
One sorely missed feature is the ability to dump the screen text to a printer. This is an odd omission from a game where collecting and deciphering information is so important. As a lawyer, you would have access to transcripts of the case you are handling. But if you want transcripts of this murder case, you'll have to keep them yourself. To minimize this inconvenience, Della keeps track of the trial's important events.

If you are a Perry Mason fan or enjoy solving murder mysteries, you'll like *The Case of the Mandarin Murder*. This is a lengthy, complex case requiring four disk sides, and will require both time and thought. The game can be saved and restarted at any time, which gives you a chance to ponder the evidence.

The Case of the Mandarin Murder lets you become Perry Mason. You'll feel the part of a lawyer, but to win, you'll have to use your brain. C

Trial Triumphs

- Study the Lawyer's Handbook carefully. A demo is included to give the novice a taste of things to come.
- Keep Drake busy digging for evidence, or he'll waste time eating.
- When trying to discredit a witness, don't anger the jury. You may win the point but lose the case.
- The program expects you to act logically, so don't be surprised by some strange answers to illogical questions.
- Bear in mind that you will learn valuable legal lessons each time you play, so relax and enjoy. It'll get easier. C



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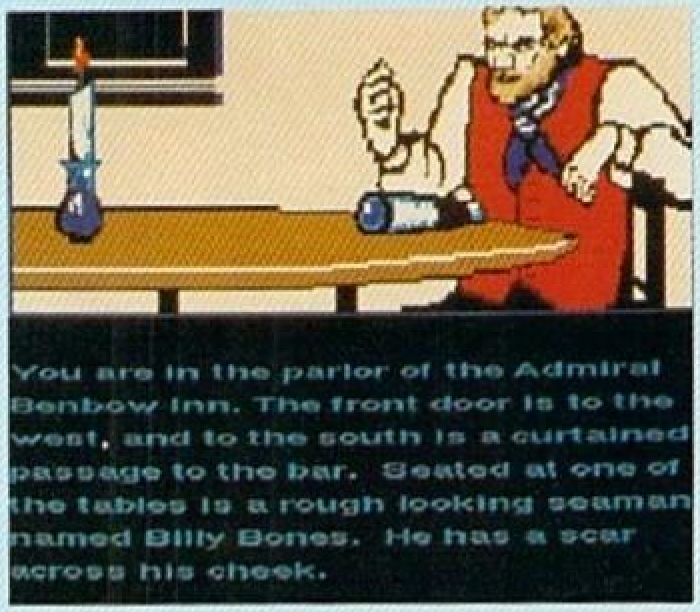
REVIEWED BY KELLEY ESSOE

Treasure Island and The Wizard of Oz

Computer: Commodore 64
Publisher: Windham Classics
Spinnaker Software
One Kendall Square
Cambridge, MA 02139
Medium: Disk
Price: $26.95 each

If you've always wanted to kick Long John Silver's wooden leg right out from under him, or personally tell the Wicked Witch of the West to go sit on her broom—here's your chance.



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You are in the parlor of the Admiral
Benbow Inn. The front door is to the
west, and to the south is a curtained
passage to the bar. Seated at one of
the tables is a rough looking seaman
named Billy Bones. He has a scar
across his cheek.
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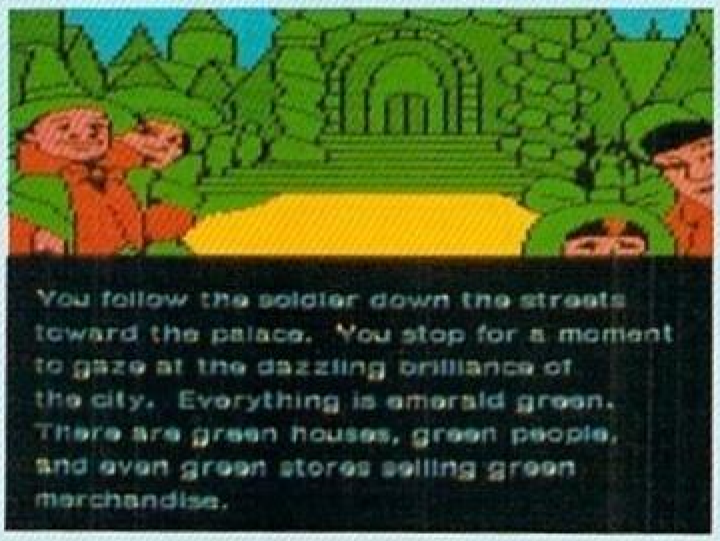

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You follow the soldier down the streets
toward the palace. You stop for a moment
to gaze at the dazzling brilliance of
the city. Everything is emerald green.
There are green houses, green people,
and even green stores selling green
merchandise.
```

I'm not alone in my love of *Treasure Island* and *The Wizard of Oz*, for these are two of the greatest classics of all time. Generations have enjoyed them. Millions have read them, including Spinnaker Software. And now, for any of you out there who have always wanted to kick Long John Silver's wooden leg right out from under him, or personally tell the Wicked Witch of the West to go sit on her broom—go ahead, be my guest. Or rather, be Spinnaker's guest, because they're the ones who are offering both of these classic novels within their line of adventure software called Windham Classics.

Windham Classics are an exciting and challenging new way to experience some of the best stories ever written. Each adventure offers full-color graphics, superb music and sound effects, easy-to-use instructions, excellent full-sentence parsing, and, most importantly, each game places you in the starring role of hero or heroine. So instead of just reading about all the fascinating characters, all the thrilling adventure, and all the exciting twists and turns as the tale unfolds—you actually get to experience the story firsthand.

For pure undiluted adventure, *Treasure Island* has never been surpassed. And Windham Classic's version not only successfully conveys the flavor, language and feel of the original novel, but does so brilliantly. From the moment young Jim Hawkins first meets the volatile Billy Bones to the climactic battle for the gold on Treasure Island, this adventure game brings to life the scenes and characters that have stirred the imagination of readers for the past century.

As Jim Hawkins, the young hero of *Treasure Island*, your goal is to recover the legendary treasure of that infamous pirate warlord, Captain Flint. Therefore, you are, of course, going to have to attain possession of the treasure map. But beware, for the burly, sea-scarred pirates who once sailed with Captain Flint are also searching for the treasure—and are not exactly going to take kindly to your intervention. Fortunately, you'll find some help from a few honest, good men like the gallant Captain Smollett, and throughout the adventure you will sporadically receive messages of encouragement (ostensibly) from author Robert Louis Stevenson, himself.

Your adventure begins on the misty shores of Bristol, England, in the tavern of the Admiral Benbow Inn. You are in the parlor, busy with your work, when in walks that mysterious seaman by the name of Billy Bones, who recently came to stay at the inn. When you muster up the nerve to speak to the rather fearsome old seadog, you discover that his tongue can be loosened only with the aid of a good shot of rum. With a full tankard in his large callused hand, he begins to weave his tales about swords and pistols, death-defying deeds, buried treasures and those irresistibly beguiling "gentlemen of fortune." Your heart beats fast, and your mind fills like a billowed sail with dreams of high seas adventure and pirates' gold. You are suddenly, helplessly, under the spell.

If, however, the book-like package of your Windham Classic is *The Wizard of Oz*, you will be Dorothy, and will explore a strange technicolor

Continued on pg. 126

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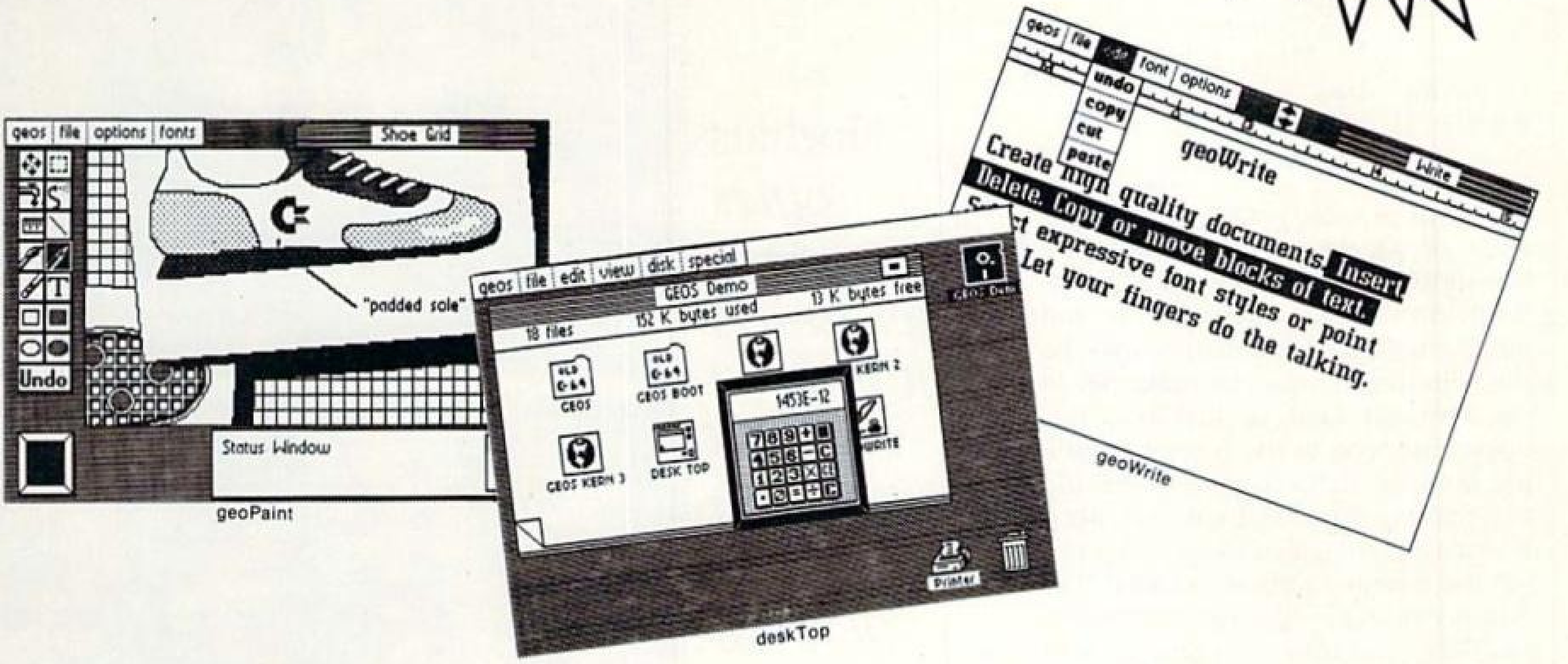

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REVIEWED BY SHAY ADDAMS

Moebius

Computer: Commodore 64
Publisher: Origin/Electronic Arts
2755 Campus Drive
San Mateo, CA 94403
Medium: Disk
Price: $36.00

Do mazes make you crazy? Do your maps of adventure games look like the scribblings of a deranged dwarf? With convenient auto-mapping and not a single maze, *Moebius* may be the solution to your dilemma. Set in the Oriental land of Khantun, this quest casts you in the role of a disciple training under a martial arts and Zen master, Moebius the Windwalker. Kaimen, a renegade disciple, has stolen the master's Orb of Celestial Harmony, causing earthquakes, droughts and other calamities. It's up to you to track him down and return the Orb.

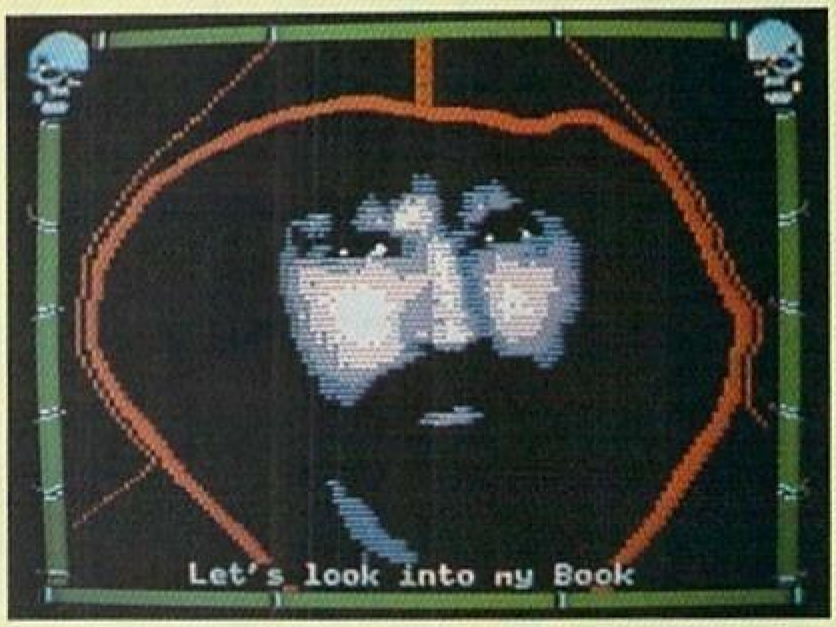
The odyssey takes you through the realms of earth, air, water and fire. Each is depicted from a birds-eye view, where the picture scrolls *Ultima*-style to reveal more of the territory as your character moves. It encompasses 26 types of richly illustrated terrain—marsh, dry ground, towers, ocean—and huge temples of white stone crisscross the land.

Among your initial belongings, you'll find a map that's displayed when the appropriate key is pressed. (All commands are issued from the keyboard, with each action listed in one of several pull-down menus.) Lines and dots show your previous path and buildings you've discovered. A blinking dot indicates your present position.

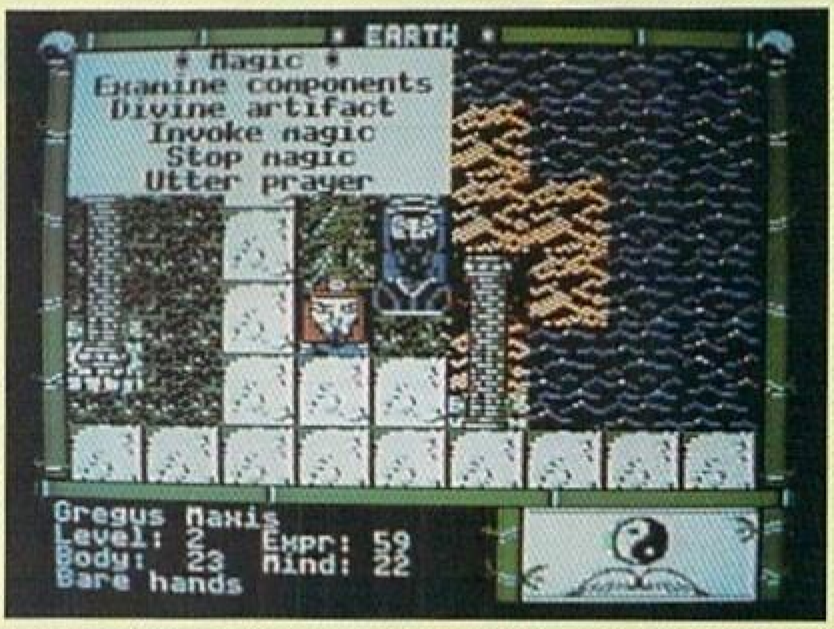
After searching the treasure chests that turn up in the bamboo groves, you'll soon find a building map that presents a detailed sketch of all the temples and other sites, and a "population lens" that reveals the location of Khantun's people. By comparing the various maps, you can get your bearings without having to draw your own.

On the road again, you can move in any of eight directions, not just four. Thick bamboo forests frequently impede your progress. By hacking away with your sword, you can clear a path. This slowly dulls the blade, but it may be sharpened with a whetstone. You have one at the start and must find a replacement by meticulously opening chests and interacting with the people—no stores will be found in Khantun. You'll also rely on your wits to acquire the necessary food and water. And instead of visiting the usual temples and priests for healing, you'll have to round up vials of body and mind elixirs yourself.

Moebius *offers determined adventurers at least 50 hours of uncommon fantasy role-playing.*



Let's look into my Book



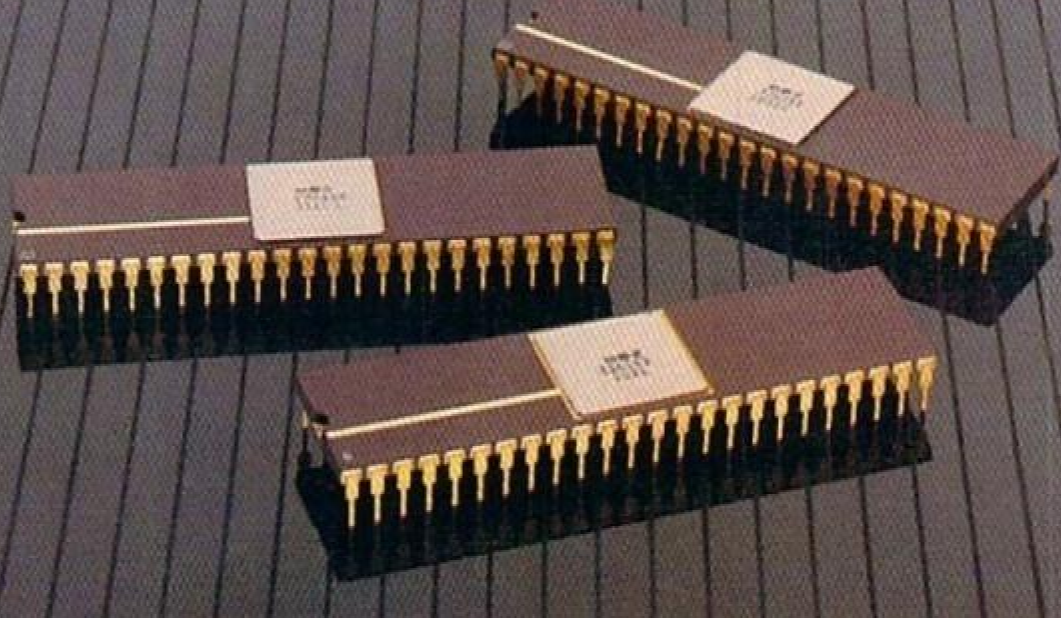
Gregus Maxis
Level: 2 Expr: 59
Body: 23 Mind: 22
Bare hands

Dangling from bamboo crosses are the victims of Kaimen's kung fu assassins, sword-wielding guards and evil monks. But if properly approached, even the dead will help you. The living citizens of Khantun are represented by large faces that drift around the land. Choose one of four phrases from a menu, and you can talk to them and get assistance. The other people you'll meet are the good monks imprisoned by Kaimen. You won't get far without rescuing and restoring them to the temples, which means defeating the evil monks now living there.

That's because five of the magic spells require fasting and praying, and the prayers won't work unless you've learned the proper mantras from the good monks. They will also bless any charms you find. With the right component (esoteric items such as panda hair or tiger teeth), each of the six charms lets you cast a different spell. A bit of reflex action is demanded, though, in order to divine the nature of a charm prior to having it blessed.

Day turns into night, rain falls, earthquakes shake the ground—these and other animated effects enliven the story as you seek the Orb. Single lines of text intermittently appear below the picture to describe the immediate situation. You can also type "L" to listen. Text describes the sounds of nearby people in distress, or of approaching danger. Tigers or the pal-

Continued on pg. 122



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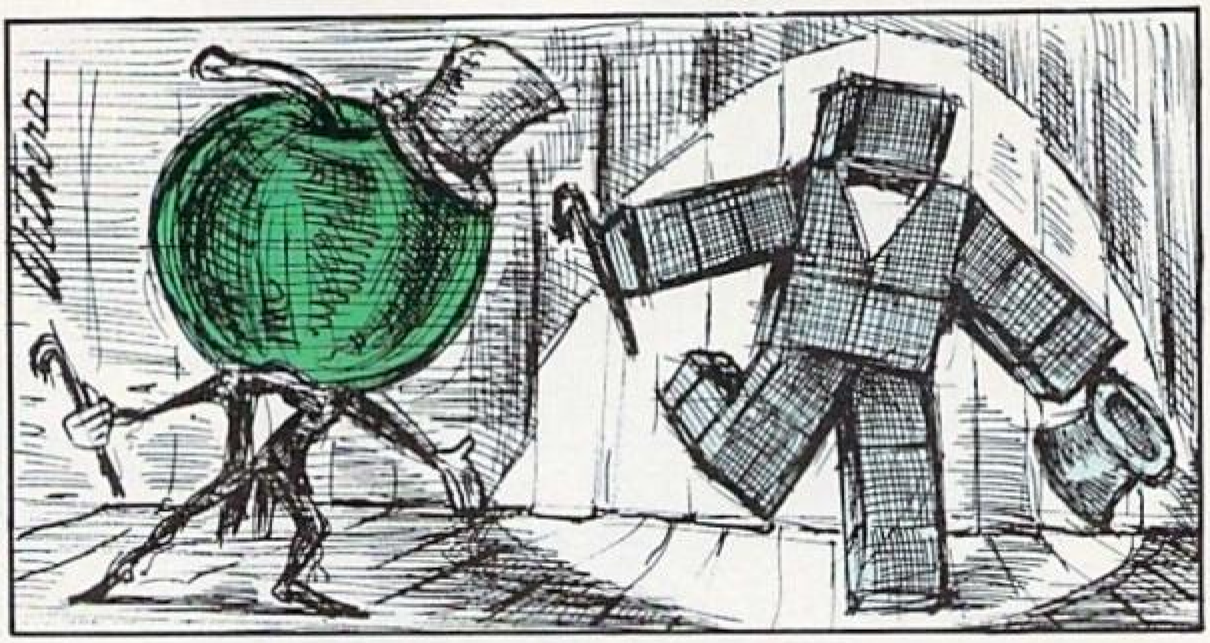
REVIEWED BY WALT LOUNSBERY

ApSoft-64



Computer: Commodore 64/128,
SX-64
Publisher: FS! Software
P.O. Box 635
Faribault, MN 55021
Medium: Disk
Price: $39.95

ApSoft-64 by FS! Software is an inexpensive way to obtain Apple II compatibility without complexity. It runs programs written in Applesoft on your Commodore 64, Commodore 128 or SX-64, uses your current disk drive and requires no additional hardware.

Since *ApSoft-64* emulates the Applesoft BASIC interpreter of the Apple II, some Apple machine-language routines will not work with the program. In other words, you cannot take just any disk directly from an Apple II and use it, and there is no means to use Apple II peripherals. However, there is a large pool of Apple II programs that *ApSoft-64* can tackle, particularly educational programs and software developed by local school systems. If you have a modem, you can download public domain programs from electronic bulletin boards. And you may want to take advantage of the unique features provided by *ApSoft-64*, which go beyond simple Applesoft emulation.

ApSoft-64 provides extra commands in addition to the regular commands of your Commodore 64. It provides all the commands of Applesoft with only a few omissions, namely FLASH, STORE, "&", RECALL, and SCRN. It does not support the Apple II DOS, and since the Commodore 64 does not have a labeled ESCAPE key, the Apple II editing-key sequences are not supported.

One of the subtle aspects of the Applesoft language is its use of "soft-switches." These are emulated by *ApSoft-64*. Soft-switches are imaginary switches in the machine that are activated by POKEs or PEEKs to imaginary memory addresses. For example, there is a soft-switch located at address −16301. Any POKE or PEEK to this address switches to the split-screen mode with text and high-resolution graphics. Other soft-switches toggle primary and secondary display screens or the high-resolution graphic mode. One of the soft-switches is not directly supported, although the equivalent is given in the *ApSoft-64* manual. For example, PEEK(−16384) will get a character from the keyboard in Applesoft, but not in *ApSoft-64*. The CALL command also may be used with negative addresses for special functions in Applesoft. Substitutes for many of these special CALL commands are provided in the *ApSoft-64* manual.

> ApSoft-64 *goes beyond simple Applesoft emulation and supports the Commodore 64's sprite generation.*

A few Applesoft programs will require some rewriting to operate under *ApSoft-64*. This is aided by a program on the *ApSoft-64* disk called "Convert." It translates most of the commands and puts the program in a tokenized format similar to the regular Commodore program format. This converted program can be saved to disk for use or further editing. If there are statements it cannot handle, it builds an extra file on your disk that contains the questionable line numbers. Once a program is sifted through "Convert," the questionable lines should be checked.

While many Apple owners claim their machine has more features than Commodore computers, a close examination reveals that Applesoft's main claim to fame is graphics commands. All of these commands and screen modes are well implemented in *ApSoft-64*. *ApSoft-64* provides two graphics screens and the plotting commands to go with them. Shape tables and condensed-plotting command files in memory quickly draw a series of lines. *ApSoft-64* also supplies commands to save these tables on disk.

The package also includes a shape file-editor, called "SHAPE-CREATE." Shape tables are very useful for repeated drawing and animation. There are commands for magnifying the drawn shape or rotating it (SCALE= and ROT=). The two tab commands are used in low-resolution graphics. VTAB and HTAB are simple commands, but they are used with alarming frequency in Applesoft programs. In fact, I think the Apple II should have been supplied with a VTAB and an HTAB key.

If graphics is the Apple II's strength, then it had better make way for *ApSoft-64*. The writers of *ApSoft-64* went beyond simple emulation and supported the Commodore 64's sprite generation as well. A series of commands allows defining the sprite locations in memory, setting up their color(s), and positioning them on the screen. There is no specific sprite data save-to-disk command, but SYS

Continued on pg. 122

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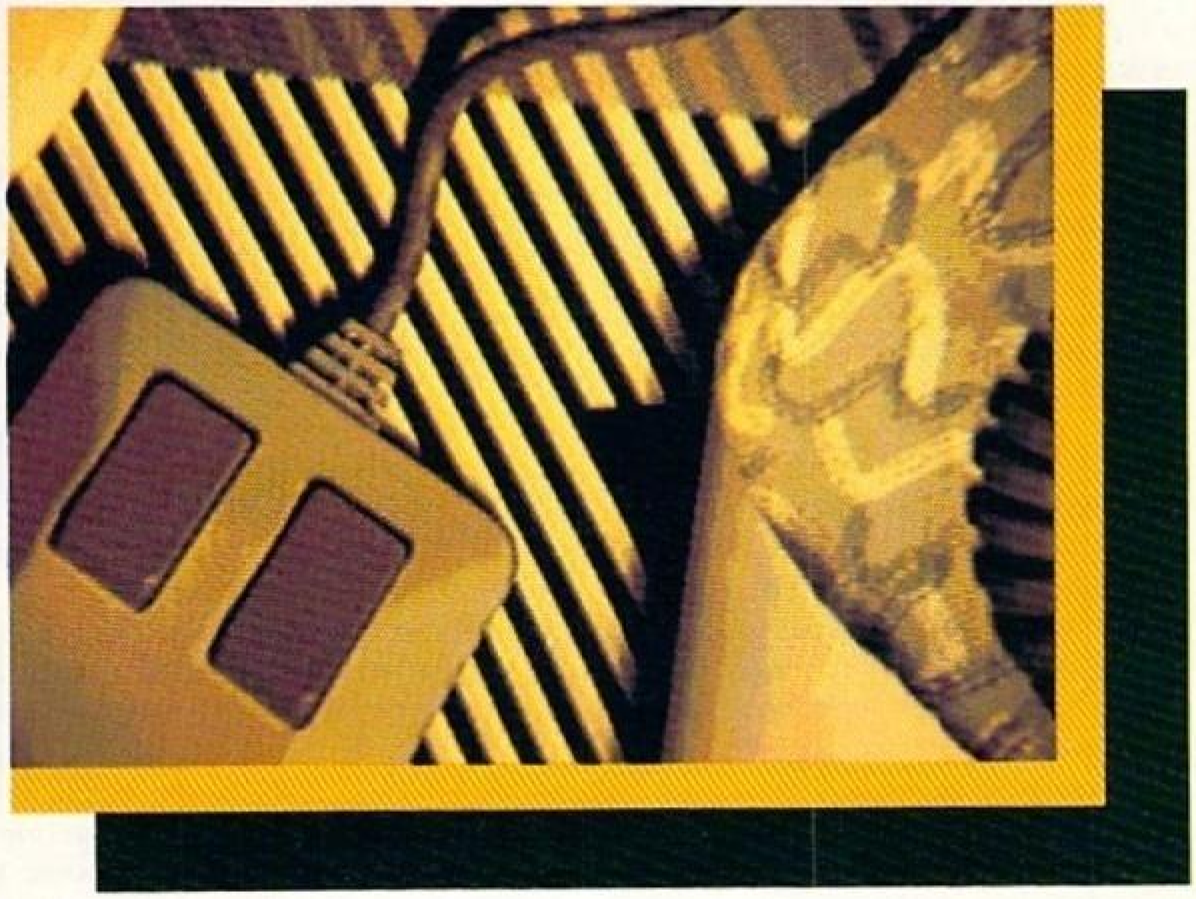

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REVIEWED BY JEFF SEIKEN

Carriers at War

Computer: Commodore 64
Publisher: Strategic Studies Group
336 Pitt Street
Sydney, N.S.W. 2000
Australia
Medium: Disk
Price: $50.00

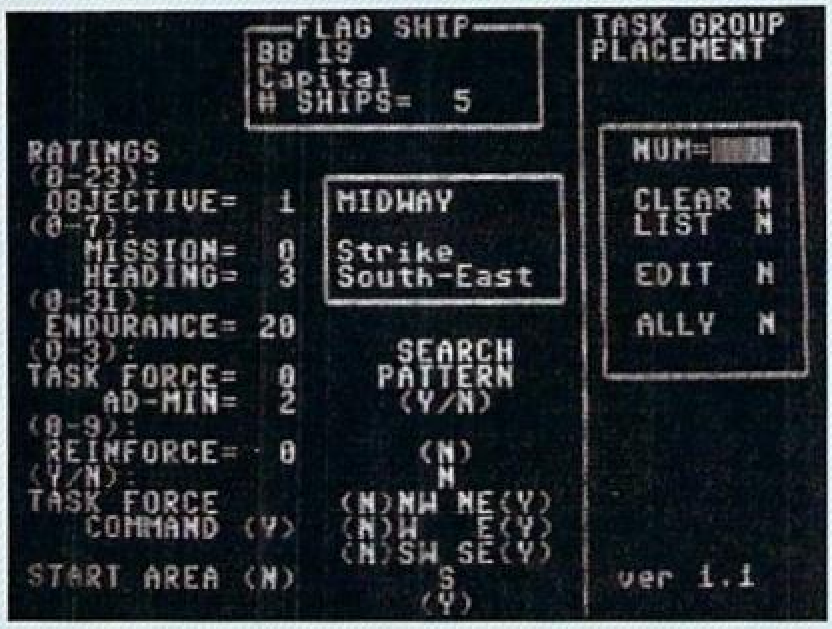
Carriers at War is a computer war game about World War II carrier operations in the Pacific. The game's excellent detail and innovative, easy-to-learn menu system make it a most attractive war game.

The game is packaged flat like a record album and opens up into a three-paneled folder. The front cover features superb artwork, dramatizing a Japanese air attack on a U.S. carrier task force. Historical notes on each of the game's scenarios plus accompanying diagrams cover the inside flaps of the folder. In addition to a two-sided disk, the game includes two manuals, three battle maps laminated for marking with a grease pencil, a fourth blank design map, and a player-aid card.

The game revolves around an extensive set of menus—30 to be exact. The menus are arranged in a flowchart-like fashion, all branching out from a single master menu. Most of the menus supply information or serve as connectors to other menus; only three menus actually allow you to enter orders. Grasping how each menu connects to its neighbors can be confusing at first, but the player-aid card provides a schematic diagram of the entire menu network. With a little game experience, cycling through the menus will become almost second nature.

An introductory tutorial in the Player's Manual for the Pearl Harbor scenario helps immeasurably in learning to play. The tutorial runs you through the entire scenario, and is meant to be read as you play, explaining what actions should be taken at each decision-making juncture. Going through the Pearl Harbor scenario once with the tutorial and a second time on your own should be sufficient to teach you the different routines for entering orders in the game.

The system of menus and orders in Carriers at War *streamlines the complexities of carrier warfare, leaving you free to concentrate on strategy and tactics.*



```
                 —FLAG SHIP——      TASK GROUP
                 BB 19             PLACEMENT
                 Capital
                 # SHIPS=  5
RATINGS                             NUM=
(0-23):
 OBJECTIVE=  1   MIDWAY             CLEAR N
(0-7):                              LIST  N
   MISSION=  0   Strike
   HEADING=  3   South-East         EDIT  N
(0-31):
 ENDURANCE= 20                      ALLY  N
(0-3):              SEARCH
TASK FORCE=  0      PATTERN
     AD-MIN=  2      (Y/N)
(0-9):
 REINFORCE=  0        (N)
(Y/N):                 N
TASK FORCE       (N)NW NE(Y)
   COMMAND (Y)   (N)W   E(Y)
                 (N)SW SE(Y)
START AREA (N)         S            ver 1.1
                      (Y)
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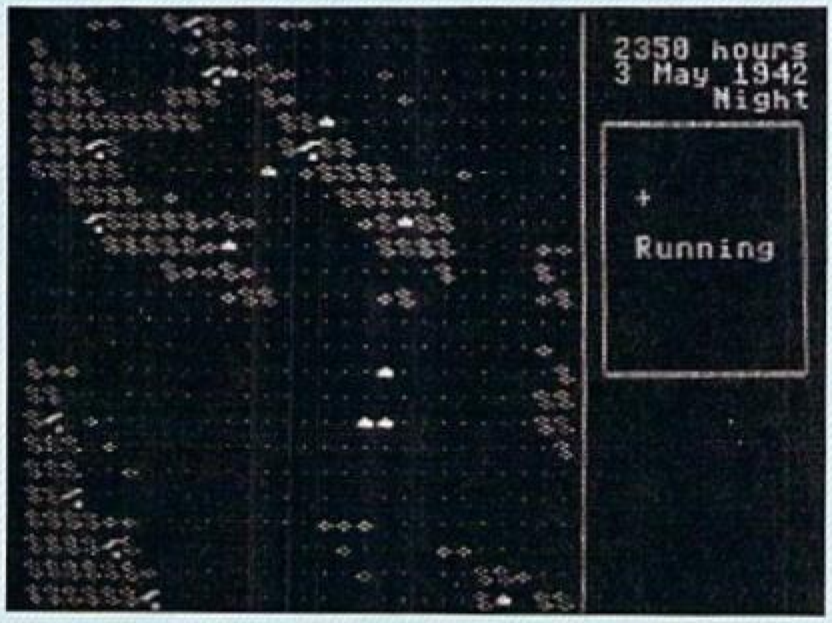

```
2350 hours
3 May 1942
     Night

 +
 Running
```

The three action menus lie at the heart of *Carriers at War*'s menu-driven system. In the "group orders" display, you set the orders for each of your task groups. There are four main types of missions: strike, cover, support, or escort. In some scenarios, task groups can also perform bombardment and transport missions. In addition to specifying the mission type, you also determine the task group's speed and course here.

The other two action menus control the launching of air strikes. In the "set strike routine" menu, you order squadrons to be armed and fueled, and assign a target for the strike. The computer calculates the distance and estimated flying time to the target, informing you if any squadrons have insufficient range. The "set order routine" menu allows you to arm your planes without sending them on an actual strike. This leaves the carrier or air base in a very vulnerable state, and also tires the crews of the readied squadrons, but has the advantage of cutting down the preparation time needed when you finally decide to launch the air strike.

Once you have finished with the orders, cycle back to the master menu and select the "run" option. This starts up the game clock, which advances in accelerated five-minute increments. While the clock is in motion,the computer executes your orders, moving task groups, conducting searches, readying planes, and sending out air strikes. For the time being, your role is finished and you can simply sit back and watch the action unfold on the high-resolution map screen. The clock can be stopped at any instant and new orders entered. Additionally, the computer will interrupt the passage of time automatically whenever a sighting occurs.

The system of menus and orders in *Carriers at War* streamlines the complexities of carrier warfare, leaving you free to concentrate on strategy and tactics. The computer handles all of the mechanical routines, taking into account factors and details you need be aware of only peripherally.

The game also recreates the swirling fog of misinformation and uncertainty so common to those real-life carrier battles. Sighting reports are often more misleading than helpful, transforming cruisers or destroyers into carriers and diverting your attention away from the enemy's main threat. Battle reports likewise suffer from a large degree of inaccuracy. In one scenario, the Japanese pilots (who were notorious for their exaggerated claims in battle) reported the destruction of nine U.S. carriers, although the entire American fleet, in fact, contained only three.

The game holds no ruder shock than being hit by an enemy air strike launched from carriers your reports said were rusting quietly on the bottom of the Pacific. The sketchiness of the intelligence available to both the Japanese and Americans creates the same potential for surprise, deceit, and blunder as the historical commanders faced in the real war.

On the flip side, however, the game system has one significant drawback: The computer must access the disk whenever entering or leaving the menus segment. This process takes close to a minute each way and can slow the game down considerably, particularly during periods of frequent sightings. But the interruptions are less of a problem because they also correspond to the periods of greatest enemy activity. Thus, you usually have enough to occupy your mind while waiting for the computer to finish accessing the disk, so you are less conscious of the delays.

In some ways, *Carriers at War* streamlines play too much, taking away decisions that belong to the players. For instance, you conduct searches merely by indicating the compass directions the search planes should follow and the computer manages the rest. The game does not allow you to order the planes to concentrate on certain sectors of the map, or even to choose the number of planes that will carry out the searches. Historically, one of Japan's costliest errors in the Battle of Midway was the failure to allocate a sufficient number of planes for reconnaissance. The opportunity to commit or correct the mistakes of history should rest with the players, not the computer.

> *The game also recreates the swirling fog of misinformation and uncertainty so common to those real-life carrier battles. Sighting reports are often more misleading than helpful.*

In the same vein, when you play an un-modified game, *Carriers at War* removes control of submarines from the players. Subs can generate sighting reports and are very useful for reconnaissance purposes, acting like an advanced picket line to warn you of the enemy's approach (which, incidentally, is how submarines were often deployed during the war—in picket lines). Designating patrol areas for submarines, therefore, is a small but still important component of planning. Yet not only does the computer pre-deploy your submarines, it does not tell you where they have been assigned. This can be corrected, however, by using the Design Manual to modify the program, as I will explain in a moment.

The large role played by the computer in handling many of the game's routines leads to another problem—it keeps you from gaining more than just a vague understanding of how some important procedures work. The fault here lies with the Player's Manual. The rules adequately explain how to play, but fail to address many of the game's finer points. For example, the rules tell you how to read the weather menu, but never describe—even in general terms—the effects bad weather will have on operations. Does high cloud cover reduce the effectiveness and/or accuracy of air searches? Are air strikes also affected?

The answers to questions like these can have a crucial role in the planning of operations. Experience may reveal some of the answers, but others will remain forever obscured in the game's machine-language programming.

Nevertheless, the true measure of a good game is whether its strengths not only outnumber, but also offset, its weaknesses. *Carriers at War* passes this test with ease. It captures the essence of carrier warfare—the importance of planning, maneuver, timing, and steady nerves. The critical command decisions require almost a sixth sense in grasping the enemy's intentions and the deployment of his task forces. Do you launch your air strikes now at the task force of battleships and cruisers already in range? Or do you wait for the enemy's carriers to be found, leaving your own carriers open to a possibly decisive strike if you are spotted first? These choices typify the kinds of determinations you will have to make during the course of a game.

Carriers at War comes with six scenarios—Pearl Harbor, Coral Sea, Midway, Eastern Solomons, Santa Cruz, and the Philippine Sea. The computer can take either side in any of the scenarios or you can match yourself against another player. All of the scenarios contain more than one command position for each side. Thus, it is possible to command only a part of the Japanese or U.S. forces in a scenario and let the computer control the rest,including the enemy's planes and ships, too. Conversely, one player could be assigned to each different command position for a multi-player contest involving up to seven people, although the logistics of cramming seven gamers around a single keyboard and monitor make me wonder how much fun this would be.

Besides supplying half a dozen game scenarios, the designers of *Carriers at War* have revealed the tools of their trade in the Design Manual, which tells you how to construct your own scenarios. The procedure is a complex one and requires about the same amount of data you would need to publish a doctoral dissertation on the subject (this is only an observation, not a criticism).

The tutorial takes you step by step through the creation of a scenario on the Japanese carrier raid on Ceylon in

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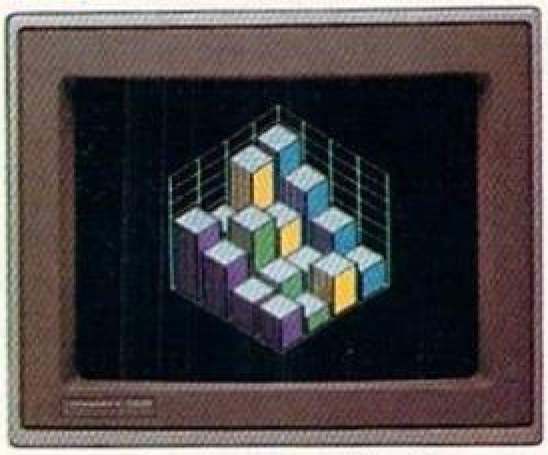
All you need to do this



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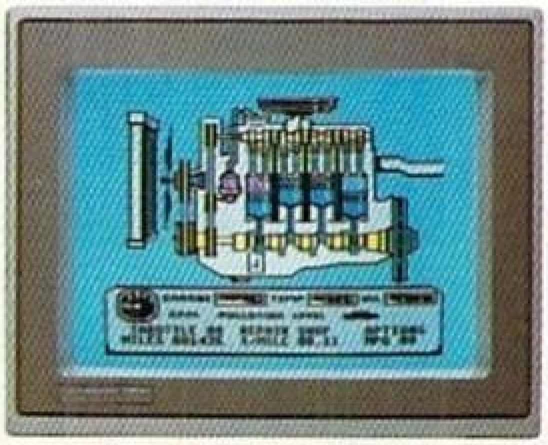

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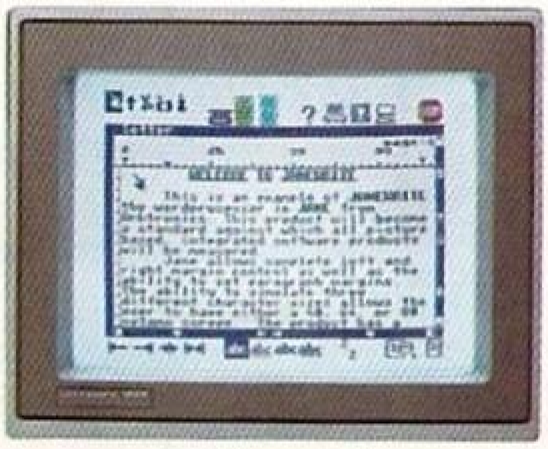
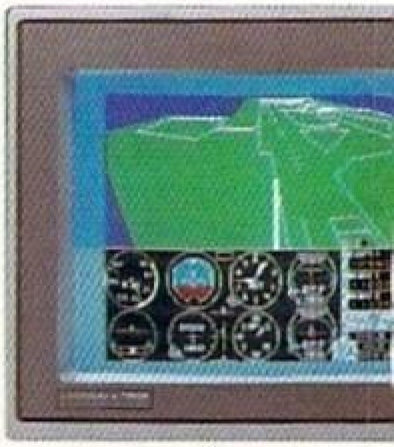


write a novel



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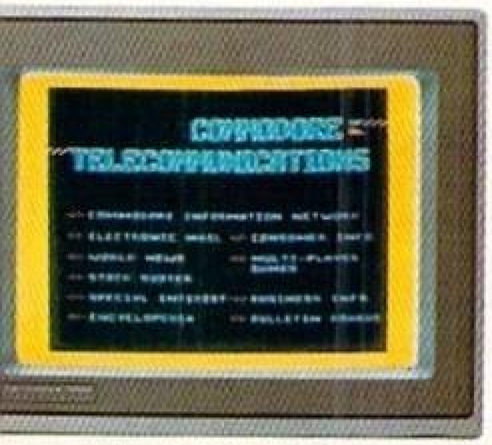
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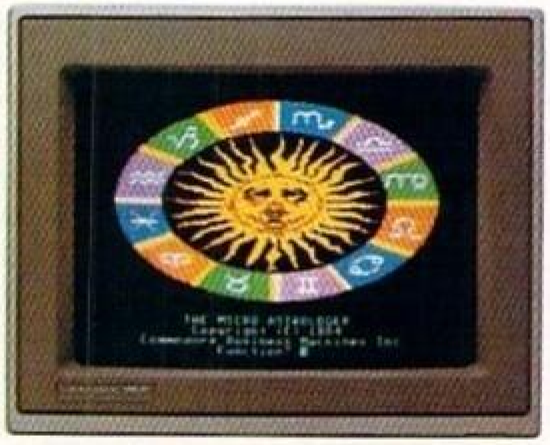
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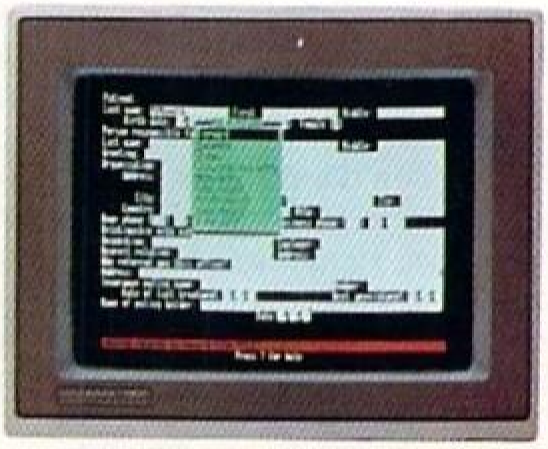

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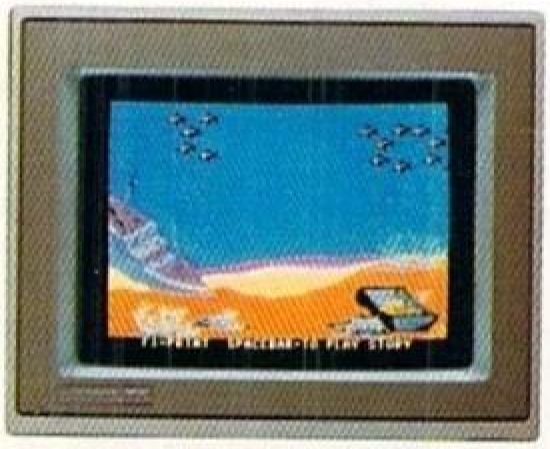

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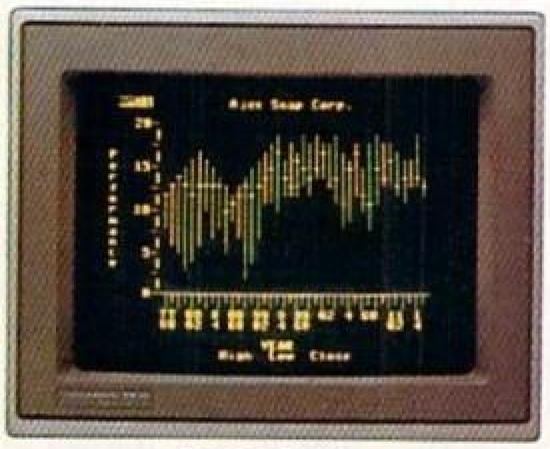
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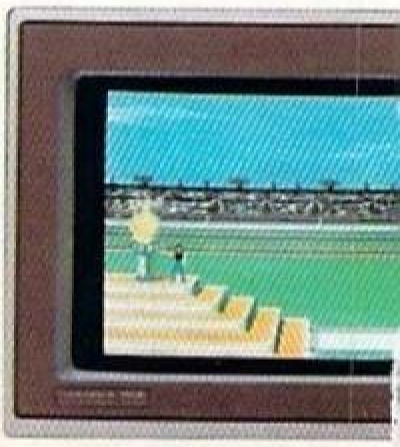

win a gold meda

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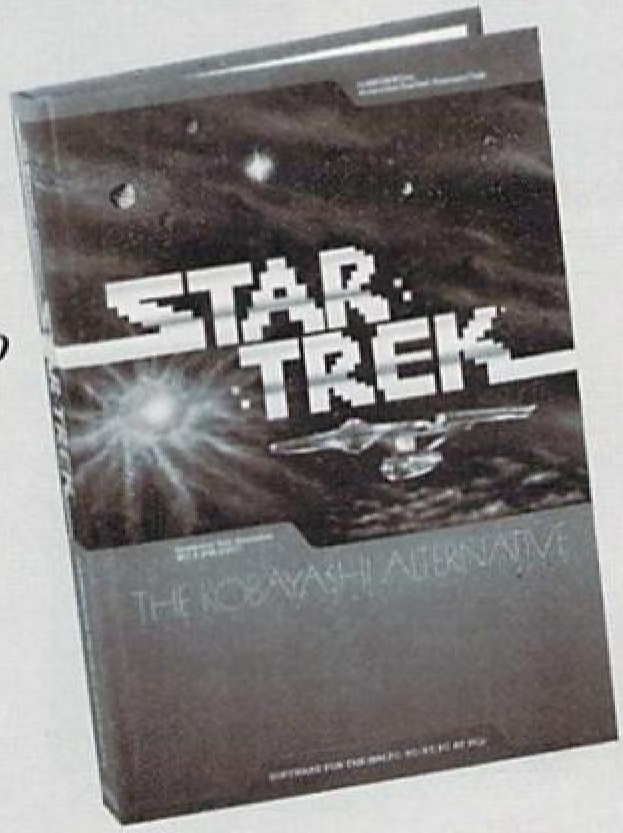
REVIEWED BY MARK COTONE

Star Trek: The Kobayashi Alternative

Computer: Commodore 64
Publisher: Simon & Schuster
1230 Avenue of the
Americas
New York, NY 10020
Medium: Disk
Price: $39.95

The circumstances surrounding the disappearance of Captain Sulu's starship are so complex that it takes a probe of ten solar systems—51 different planets—to uncover all the clues.



Any ardent follower of the Star Trek saga can probably guess the foundation of this contest from the program's title. These Trekkies may remember one particular scenario that dealt with Captain Kirk's Starfleet Academy's cadet-performance evaluation exercise, a fabricated "no-win" mission administered to all members of the graduating class in an attempt to determine the Federation's potential commanders. This test was entitled the Kobayashi Maru, and, of course, Kirk not only proved his worth by risking his neck, but also established his superior analytical skills by successfully resolving this "unsolvable" situation. Kirk's unprecedented completion of the Maru mission brought to light the need for an upgraded, more formidable challenge for this new breed of distinguished Academy graduates. And so we have the Kobayashi Alternative.

Players enter this adventure as the legendary James T. Kirk, aboard the USS Enterprise as commander of a starship dream-squad. Spock, Scott, McCoy, Uhura and Chekov are among the notable crew members. The only one missing from the ship's register is Captain Hikaru Sulu, your close friend and former helmsman. While he was acting as temporary captain of the USS Heinlein, Sulu's starship vanished. The circumstances of this disappearance are so complex that it will take a probe of ten solar systems—51 different planets—to uncover all the clues.

Upon acceptance of the mission to find Sulu's ship, prospective Captains obtain all necessary background and briefings from the 30-page manual. After reviewing a couple of introductory letters from Starfleet, a printed copy of Sulu's last transmission, and an overview of the Enterprise's crew and operating systems, the player eases into the Bridge Commander's chair.

As both strategic leader and interplanetary detective, your responsibilities are many. Not only must you search for and sift through pertinent facts to reconstruct the Heinlein's disappearance, but you are also accountable for the safety and well-being of the Enterprise and all its inhabitants. True, you do have the assistance of some highly skilled helping hands, but in the end, all areas of navigating, fighting, maneuvering, transporting, and communications are under your direction.

To facilitate the incredible influx of information that each Captain must access, *Star Trek*'s playfield is unique. Instead of the usual full-screen input/response scrolling format that has become the staple of most prose contests, the authors have opted to divide the screen into a stacked series of interactive text windows. This allows for a variety of intelligence sources to be tapped and attended to simultaneously, providing a good imitation of the break-neck pace witnessed so often on the television rendition of the starship's bridge.

The bottom quarter of the screen displays the status of the vessel's function boards. This acts as a priceless monitoring panel to keep tabs on factors like speed, destination, and location, as well as engines, shields and phasers.

The narrow two-line window above this is an area where you, in the role of Kirk, can communicate with your crew. Here, orders and questions are directed towards an individual as if you were actually speaking to him. So, a command such as, "Take Spock to the transporter room" might now be phrased as a conversational exchange, like:

"Spock."
"Yes, Captain?"
"Go to the transporter room."
"Acknowledged, Captain."

The statements typed in this area can only represent your voice. All physical movement (north, south, left, right) or nonverbal action (give, take, shoot, examine) is carried out by pressing specified function keys.

Any type of response to your "spoken" addresses appears in the remaining upper portion of the screen. Each entity you approach has a unique personality, so the interchanges can be lively, humorous, and realistic. Every attempt has been made to capture the characteristic color that the Star Trek series helped incorporate into each crew member. Trekkies are sure to get a kick out of McCoy's snappy responses, Spock's unemotional deductions, and Scotty's unmistakable accent.

This is Simon & Schuster's first attempt at an adult text adventure, and they should be commended on their smooth ride and accurate representation of the Enterprise. Veteran and novice adventurers on their maiden voyage might be thrown off balance by the unusual command process, but this is to be expected. After you have a few rap sessions with the crew and familiarize yourself with the visual layout and "speaking" technique, the ship's bridge will feel like home.

The only lingering problem I encountered was when I was confronted with user errors. Whenever any incorrect command is entered, the computer responds with "Alert, you must use Starfleet Protocol." This identifies that a problem has arisen, but does little to specify its nature. Misspellings, incomprehensible statements, and incorrectly approached crew members all result in the same ambiguous reply. At times, you will be left wondering exactly what you've done wrong. To an easily frustrated explorer, or someone who is simply unfamiliar with the Star Trek itinerary, early goings may be a bit trying.

But the first-rate adventure that is beneath this initial technical difficulty is well worth the occasional struggle. The ensuing exploration of the ten solar systems is akin to involvement in ten related but separate adventures—each worthy of its own television episode. Every planet has its own diversified surprises to offer, and each will have to be approached a little differently to obtain the concealed clues. Even if you can't distinguish a Klingon from a Tribble, there's a variety of imaginative lands and beings to visit. At light speeds, you can move between such mismatched planets as Niau, a world entirely populated by females, and Orna, a land that is home to a giant protoplasmic/amoeboid species. Once familiar with the specialized jargon and the multitude of available options, you will find it quite easy to carry out your every desire.

And if, by chance, you are one of those true Trek fans who still lives for those classic midnight reruns, then *The Kobayashi Alternative* is a fantasy come true: your chance to join the Enterprise immortals in a brain-straining stint through the final frontier. Beam yourself aboard, strap yourself in, set your coordinates, and be on your way. And may you live long, and prosper.

Quick Captain's Course

The designers of *The Kobayashi Alternative* have taken great pains to depict the Enterprise. Unfortunately, when the simulation is approached by a non-Trekkie like myself, lessons in Starfleet ways can come the hard way, often by death or imprisonment. The orientation manual that accompanies this adventure will give Captains a good start, and perhaps these tips will keep them going.

- Successful completion of this adventure requires the exploration of ten different planets, one from each solar system. It is easy to designate the planets to be visited, for they are the only ones which will detail landing coordinates during an orbital "scanning." Never try to transport yourself onto a planet's surface without *exact* coordinates. A couple of mistaken yards in any direction, and you might materialize yourself in the heart of a mountain. Besides being ill-advised, it is always fatal.

- Know your ship and crew. The manual gives a rundown on some of the important names and places aboard the Enterprise, but leaves much uncovered. To be sure, many of the locations on the 23 levels in the starship are mere window dressing—like the bowling alley up on deck 21—but a serious Captain should note the following people and places. You never know who might be pressed into service.

Deck #1	(Bridge): Although it is never mentioned in any of the documentation, Commander Avoca is your new helmsman, manning the position vacated by Sulu.
Deck #2	(Starship Lab): Supervised by Kerasus.
Deck #5	Contains the sleeping quarters of McCoy, Spock, Uhura, Chekov, and Kirk.
Deck #7	Security—with crewmen Ohara and Lee. Library—supervised by Litowinsky. Sickbay—Burke helping McCoy with duties. Transporter—the location where you can pick up a Phaser, Communicator and Tricorder from Renner, Scott's aide. Engineering—where Maraht oversees the Antimatter.
Deck #8	(Rec Deck): Where else can you get a copy of *Casablanca* in deep space? Monitored by Tanzer.
Deck #12	Observation Deck.
Deck #16	Warp Drive — guarded by Freeman.
Deck #19	Shuttlebay for the Galileo craft.
Deck #22	Computer.

- Above all, *The Kobayashi Alternative* is a screening exam for potential Federation Captains. You're supposed to be a leader, so act like one. This program will dismiss you (with a low score) if you appear to be mentally unraveling at your command post. Even if you are unsure of what to do, don't let others know you are panicky.

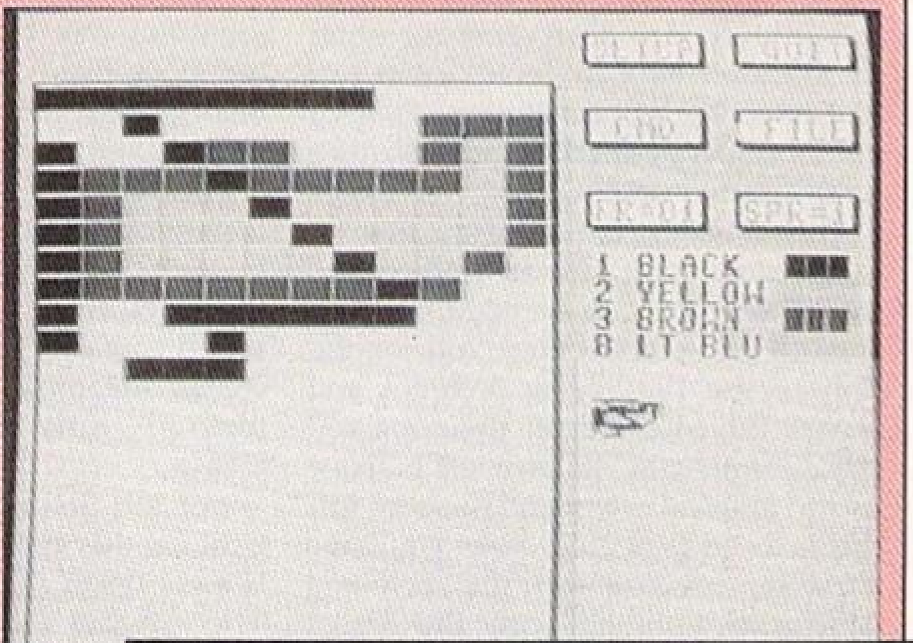
- If you can't seem to get a crew member to understand a command, there are a few possible reasons. First, check to see that the person you are addressing is capable of carrying out your order. Each member of the crew can only perform his or her designated chores. Make sure the order fits. Or perhaps your error is one of protocol. Check to see that you are using correct terminology. If you still can't get the person to comply, then the order you are giving is probably incidental. Try to approach the problem in a different way.

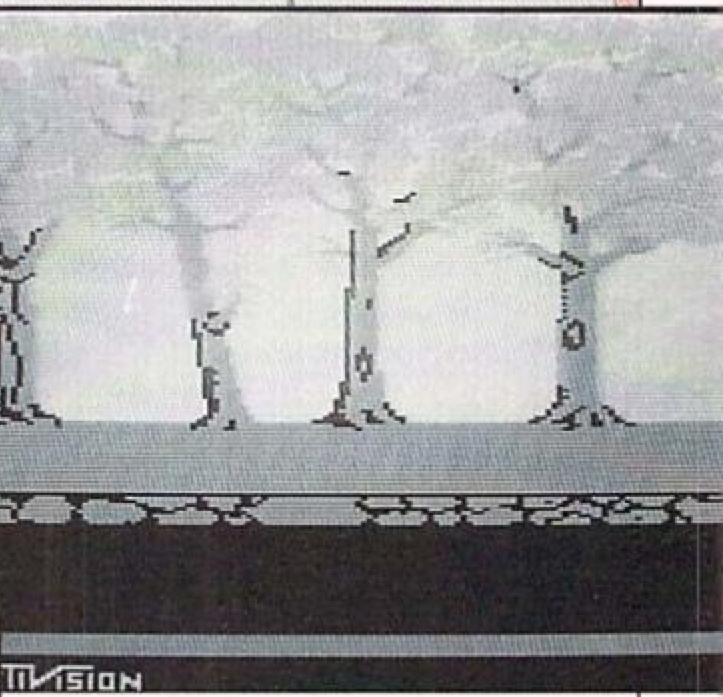
REVIEWED BY ERVIN BOBO

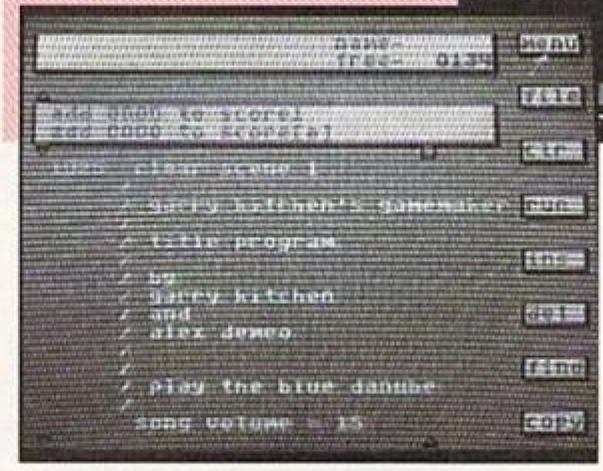
Gamemaker

Computer: Commodore 64
Publisher: Activision
2350 Bayshore Frontage Road
Mountain View, CA 94043
Medium: Disk
Price: $29.95

> *If you've ever had an idea for a game but doubted your programming abilities,* Gamemaker *is for you.*







```
clear scene 1
  gary kitchen's gamemaker
  title program
  by
  gary kitchen
  and
  alex demeo
  play the blue danube
song volume = 15
```

Using a programming formula that proved successful in *Designer's Pencil*, author Gary Kitchen has fashioned a logical, easy-to-use construction kit, filled with bits and pieces of games that can be put together in any number of ways. Or, you can design your own bits and pieces, using the several editing routines, to make games that are truly original and personalized.

After booting the double-sided disk, you arrive at the editor. Here are the paths to the various libraries and editors as well as the main program editor. In a window at midscreen are all the programming lines you'll need, arranged in alphabetical order so that you may scroll through them quickly to find the one you want.

Once you've found the line, click the joystick button to move it to the actual program area below, then push your stick forward or back to find the next line you need.

Should your selected line call for a variable or a sprite, that part of the line is highlighted until you fill in the information, such as screen coordinates or spritename. It is as easy as it sounds, and the pre-written commands save you both time and syntax errors.

From here, you may access the libraries that are contained on the flip side of the disk: a library of sprites, sound effects, backgrounds, and music. I suggest you page through these libraries first to familiarize yourself with them. Or, if your idea calls for something not contained in a library, you may go to the appropriate editing mode and create your own sights and sounds.

The sprite editor is familiar, consisting of an enlarged grid where the sprite is constructed with joystick clicks and movements, as well as a "life-size" image of the sprite you're creating. The background editor works the same. The enlarged grid makes fine detail possible, and allows you to make sure that outlines are completely closed before filling them with color.

To me, the creation of sounds and music is still a mystery. Yet, in hopping around the editors with a joystick, I was able to create credible sounds and incredible music. Fortunately, for others like me who may have a tin ear, the library of sounds and music is quite simple.

Any game elements you create can be saved to your own library disk, and any game created can also be saved to disk. This way, you can write games and share them with friends who do not own *Gamemaker*.

Or better yet, enter your best effort in Activision's contest! The rewards for winners of the contest include both money and publication. I'm sure my game, where you shoot arrows at race cars and get a quacking sound at every hit, will be the one—but go ahead and send yours in, anyway.

How good can the games be? It's anybody's guess. Experiment. Strive for greatness. If you've ever had an idea for a game but doubted your programming abilities, or if you've ever wondered how the elements of a game are combined into a whole, then *Gamemaker* is worth your consideration.

In fact, although the name belies it, I think it is as valuable for dissecting as it is for construction, allowing you to take a game apart and examine it piece by piece. Perhaps it should have been called *Gamemaker/Game Un-Maker*. ■

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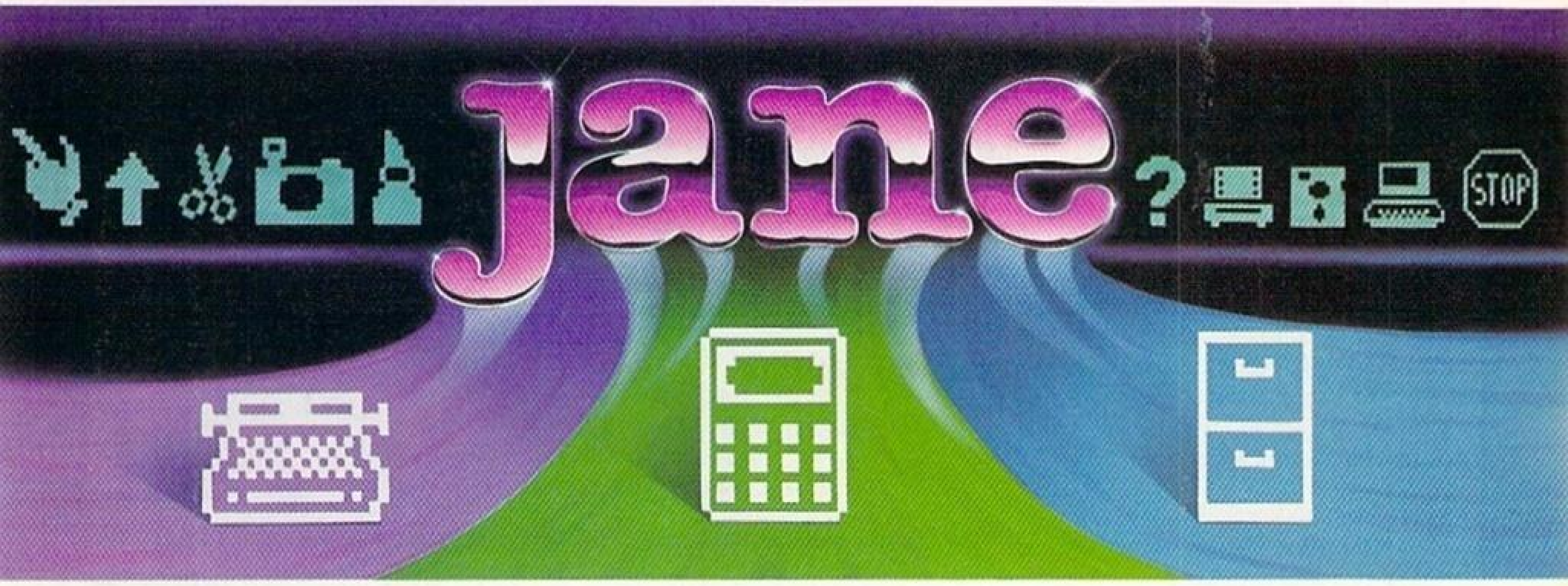

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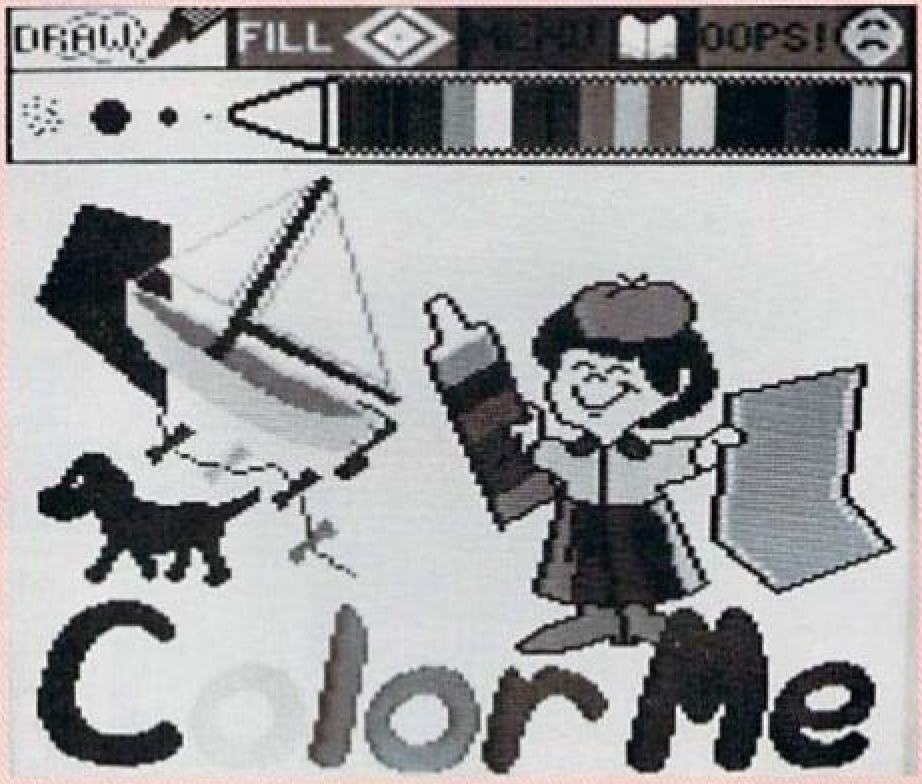
REVIEWED BY PAM HOROWITZ

ColorMe and Show Director

Computer: Commodore 64
Publisher: Mindscape
3444 Dundee Road
Northbrook, IL 60062
Medium: Disk
Price: $29.95

Mindscape has two programs which bring out the creativity in kids of all ages. *ColorMe, The Computer Coloring Kit* is designed for the armchair artist, and *Show Director* is an excellent program for those who dream of directing the sequel to *Cats.*

ColorMe *is a drawing and coloring kit designed for children ages four and up.*



ColorMe

ColorMe allows the user to create original pictures by incorporating predrawn characters from the *ColorMe Picture Disk.* It has simplified icons and menus that make it extremely easy to use—even for very young children. The program disk enables budding young artists to create original art, and the *ColorMe Picture Disk* lets them "cut and paste" predrawn designs or original creations. The finished masterpieces can be saved and/or printed. *ColorMe* can also be supplemented with a *ColorMe Supply Box* containing printing paper, buttons, a coloring book binder, cards, and envelopes.

The opening screen of *ColorMe* has a simple menu and a blank "drawing board." A crayon functions as the printer, allowing the child to select from five different options. He or she can draw outlines using "crayons" of varied thicknesses and can choose from 16 vivid colors. The outlines can be filled in with color using the "fill" icon. If erasing is desired, the child simply points to the "oops" icon. Names (or any text) can be printed by pointing to the "text" icon and typing letters on the keyboard. The letters can be varied according to size and color.

If the fifth icon is selected, a new menu appears with additional choices. This menu contains the cut-and-paste option, clearly defined with a small scissors. There is also a magnifier which allows the child to see an enlarged version of small details.

The *ColorMe* program is whimsical and fun, and can provide hours of creative entertainment for almost any age.

Show Director

Show Director puts your name on the director's chair as you write the script, choose the background, select and animate the "stars," and coordinate background music and sound effects. Like *ColorMe, Show Director* is an excellent example of structured creativity, and provides the user with the tools necessary to create "a really big show." *Show Director* is more sophisticated than *ColorMe,* and is recommended for the eight and older set.

After the opening scene, which puts your name in lights, you decide whether to begin your production by writing the script or getting right to the action. If you decide to develop the plot first, you will use *Show Director's* built-in word processor. The word processor is quite complete and contains full cursor movement, insert and delete, and page display commands.

Lights, camera, action! Your name appears on the director's chair, and you view the scenery selections. You can choose from three cave scenes, three haunted mansion scenes (with a graveyard, of course), and three forest scenes. And if you've secretly yearned to do a remake of *Cleopatra,* there's a desert scene complete with pyramids. You can also select the "design your own background" option, which splits the screen into three sections: ground, middle, and sky.

Next comes audition time. You select your stars from 40 characters comprised of actors, actresses, and animals. Up to four characters can be included in any one scene. After the cast has been chosen, you become an animator. Each character gets a 30-second movement sequence, using a joystick or arrow keys. A color bar at the bottom of the screen helps you keep track of the time limit.

You have a choice of background music, from dramatic or funny to scary or sad. You can also choose several special sound effects, such as an earthquake, ghost, motor, chirp, or footsteps.

Once you've compiled the components of your major motion picture, you have the option of changing it. You can add scenes, change scenes, or run it as is. The step-by-step creation process is fascinating, and the end results are very satisfying. Overall, the program is very well done and takes little effort to master. The documentation is clear, concise, and easy to follow.

Both *ColorMe* and *Show Director* are excellent examples of computerized creativity. They provide basic creative tools, and the results are limited only by your imagination. ◼

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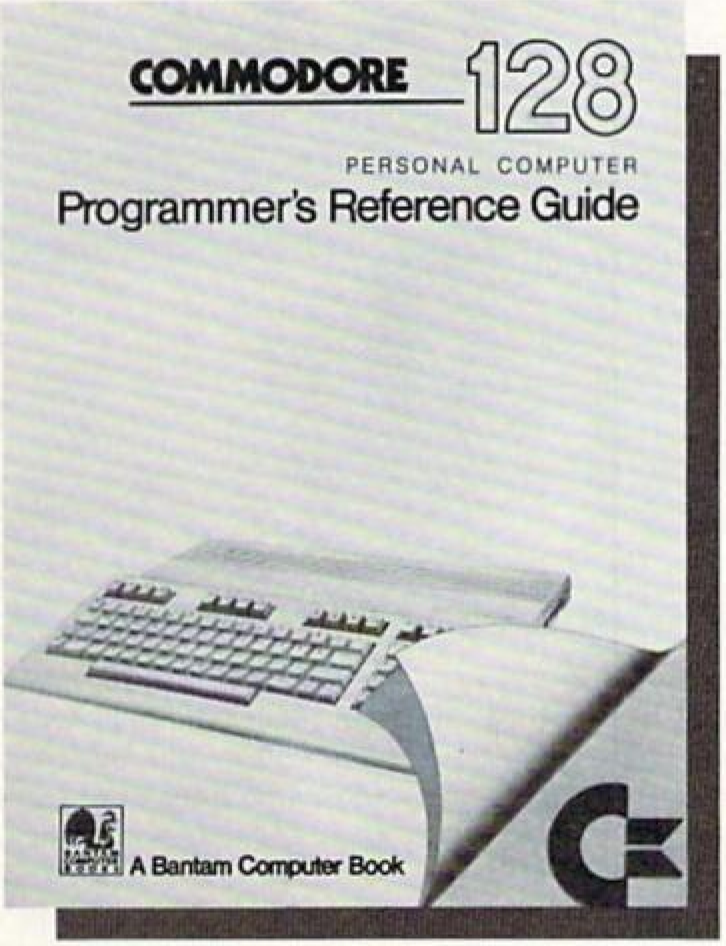

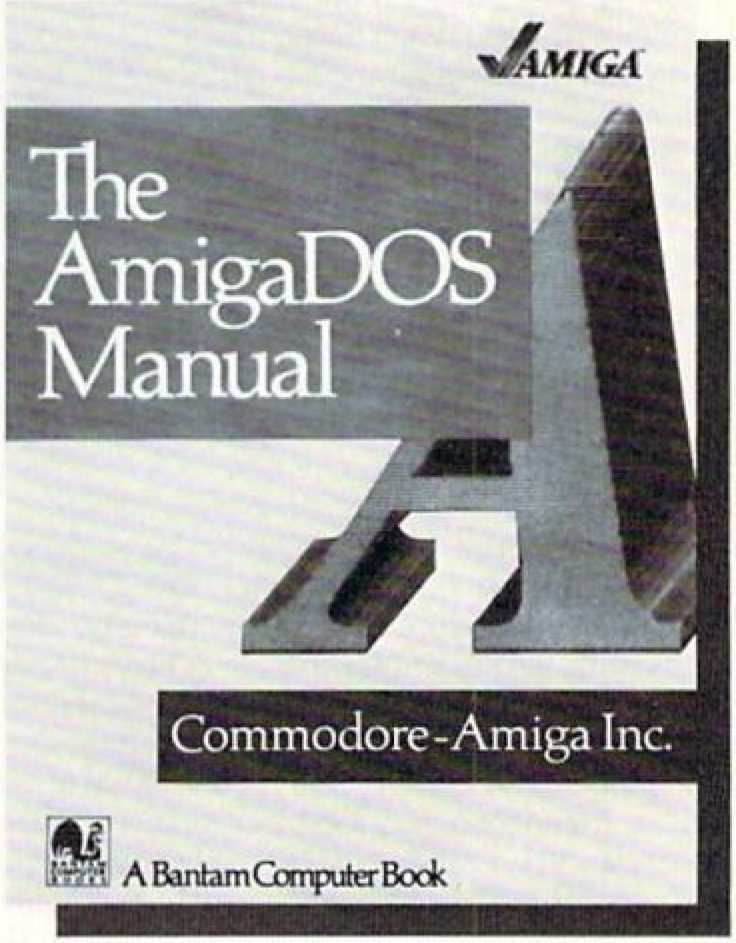

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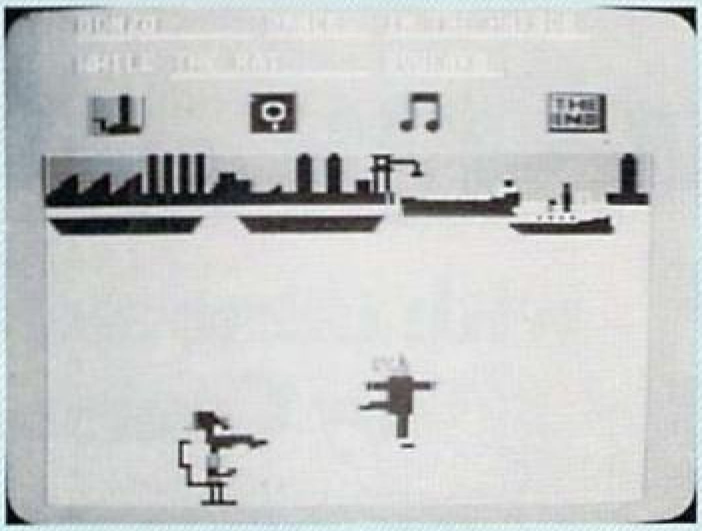
Available at bookstores and computer stores nationwide.

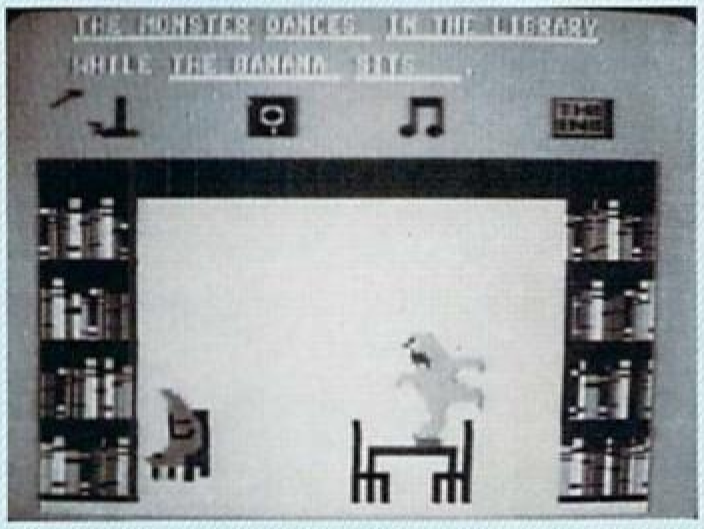
REVIEWED BY JACK EMBERLY

Kermit's Electronic Storymaker

Computer: Commodore 64
Publisher: Simon & Schuster
1230 Avenue of the
Americas
New York, NY 10020
Medium: Book and Disk
Price: $29.95

Kermit's Electronic Storymaker *gives children an opportunity to master 20 different sentence constructions.*





THE MONSTER DANCES IN THE LIBRARY
WHILE THE BANANA SITS .

Tanya, my kindergarten friend, doesn't know the names of all the letters. Nevertheless, with help from the computer and *Kermit's Electronic Storymaker,* she learned the meaning of "words," composed a story about Kermit, and then "read" it back to me. This pre-schooler was learning the basics of reading before grade one.

Kermit's Electronic Storymaker is a composition exercise that requires children to fit words and phrases into grammatically correct sentences. Its main instructional focus is the immensely important, yet often unaddressed, language development in children ages three to six. And for that group, who better to explain the mysteries of the printed word than Kermit the Frog of Muppet fame?

Kermit is a friend and mentor of children because, like Carl Sagan, he teaches and amuses at the same time. In *Kermit's Electronic Storymaker,* the subject is "syntax," the meaningful arrangement of words within sentences. For small children, understanding the variety of sentence patterns in speech, and later in books, is often as difficult as unlocking the meaning of the Cosmos. What makes the process so frustrating is the abstract nature of words. To a five-year-old, the question is still, "What is a word?"

Kermit's Electronic Storymaker is a solution. First, it "shows" children words by employing images and sounds. Second, it demonstrates how words fit into new and unexplored sentence patterns. *Kermit's Electronic Storymaker* gives children an opportunity to master 20 different sentence constructions. Grade six teachers who thought sentence variety was extinct better take a look at this.

The book is a dictionary of 58 words and phrases about Muppets and the things they do. Eighteen of the words are action verbs such as "swims," "flies," and "bounces." Another group contains conjunctions such as "while" and "as." Together with nouns these words form the building blocks of sentences. The book familiarizes the child with the vocabulary and sentence patterns he or she may later employ in their own compositions.

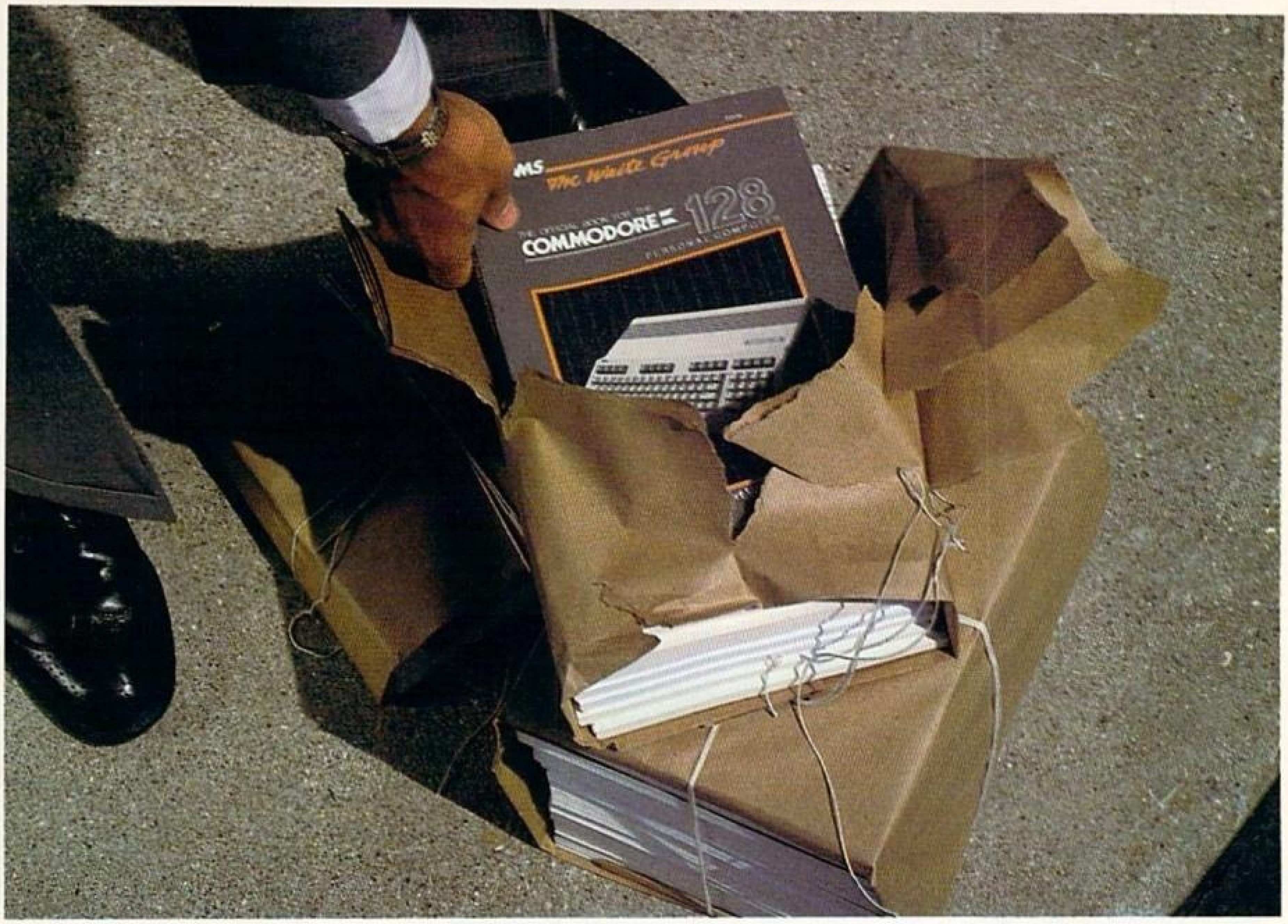
After you boot the program, four control symbols appear at the top of the screen: a joystick, disk, and two musical notes. Aiming a small arrow at these symbols activates the movement of the Muppet characters, the saving of stories for later recall, and musical accompaniment. Below these are solid blank lines which represent the first of many sentence patterns. Presented in this "template" fashion, these lines are the function slots of a grammatically correct sentence.

To begin, point the arrow at the first position, which in this case is the subject position. The words and corresponding illustrations of Kermit and the other Muppets will then appear. The child continues to choose words in this manner until the story is complete. At that point, the child may go on to a new set of blank lines and a new and more complex sentence pattern, or pause and experiment with the sentence and scene just created.

Upon completion of our first story, Tanya and I watched as Kermit flew "in the cave." Tanya saw for herself the meaning of each word or phrase, and understood how and why they fit in a printed sentence. Mostly, though, she simply enjoyed the show.

Later, Tanya used the command mode to direct Kermit's movements herself by moving the joystick up, down, left or right. She was delighted. In the world of small children, where all power and decision rests with adults, such moments of freedom are the building blocks of self-confidence. So great was her involvement that once, as Kermit danced joyfully on bustling city streets, Tanya frettingly steered him away from traffic. "I've got to steer him over here," she ex-

Continued on pg. 42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plained, "so that he won't get run over."

My imagination was also busy. As Tanya moved Kermit about, I thought of questions to help expand her grasp of spatial concepts, those perceptual gremlins that sometimes result in reversed letters such as "b" and "d," "m" and "w." "Let's see if you can make him dance in the top right hand corner," I suggested. And then, "How about the bottom?" or, "To the left corner."

In similar fashion, I asked other questions to enhance Tanya's story comprehension, and test her emerging awareness of how spoken words and the text paralleled one another. Step one was a question to determine if she knew what was meant by a "word." She did, and proved she recognized the physical boundaries of words by counting those in her sentence.

Next, I asked her to point to individual words which depicted the character in the story, the action he was engaged in, and where the action was occurring. "Which line do we use for Kermit or his friends?" I inquired. "And which one is for what he does?" Willingly, Tanya answered, and more and more frequently her responses were correct.

For example, the following sentence appeared on the screen: *Kermit swims under the sea.* Tanya "read" this to me, but how was she able to decode the words accurately and in correct sequence? She had chosen Kermit to be the subject of her story, so therefore, the word "Kermit" would logically begin her sentence. Reinforcing that assumption was the illustration of Kermit swimming under the sea. In "telling" me a story like this one, her mastery of oral language and its rules told her to begin with the subject and follow with a verb. Thus, she correctly anticipated the same pattern in text. The simultaneous on-going visual images confirmed her assumptions.

All these clues helped Tanya understand the workings of more complex and unfamiliar sentence patterns. By coordinating the appropriate visual image and wording, *Kermit's Electronic Storymaker* provides a bridge from hearing and understanding new sentence patterns, to composing and reading them.

Tanya was certainly entertained by *Kermit's Electronic Storymaker,* but I think she also appreciated it for what it taught her. I, too, found it enjoyable, but my greatest thrill came through watching Tanya learn about language. How much was she actually learning? I assessed her growing awareness by having her point to the line where the character word will be entered, or to the line that will tell where he will dance or swim. Tanya's correct responses indicated she was beginning to master the written code she would one day use in her own writing.

How much understanding of language Tanya brought to this program and how much she learned from its use is difficult to determine. Without a doubt, however, many aspects of its presentation assisted Tanya in her association of speech with text. It would require much more space to fully explain the full range of language "readiness" skills fostered by *Kermit's Electronic Storymaker.*

Too many adults still believe a child should be able to merely recite the ABC's when he or she enters school. Of more value is a firm understanding that words in print are the same as words in speech. That conceptual realization, combined with a command of rich and various oral sentence patterns, would do a great deal to ensure a child's early success with reading and writing.

In the meantime, though, let no one hesitate to use *Kermit's Electronic Storymaker.* I have nothing but praise for it, and Tanya has but one request. She'd like to suggest a small addition to the Muppet cast of characters: the Peanut Butter Sandwich. It's a reasonable idea. After all, what's a kid's activity without a peanut butter sandwich?

Jack Emberly is an Elementary Learning Assistance teacher with 14 years of experience. He is presently teaching a program for gifted children that includes computer studies.

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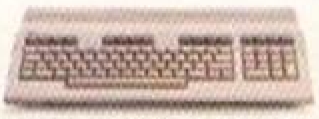

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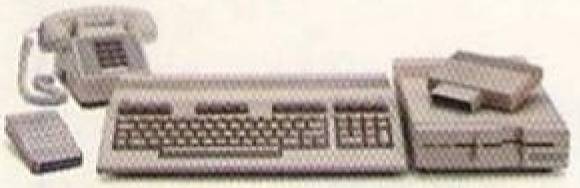

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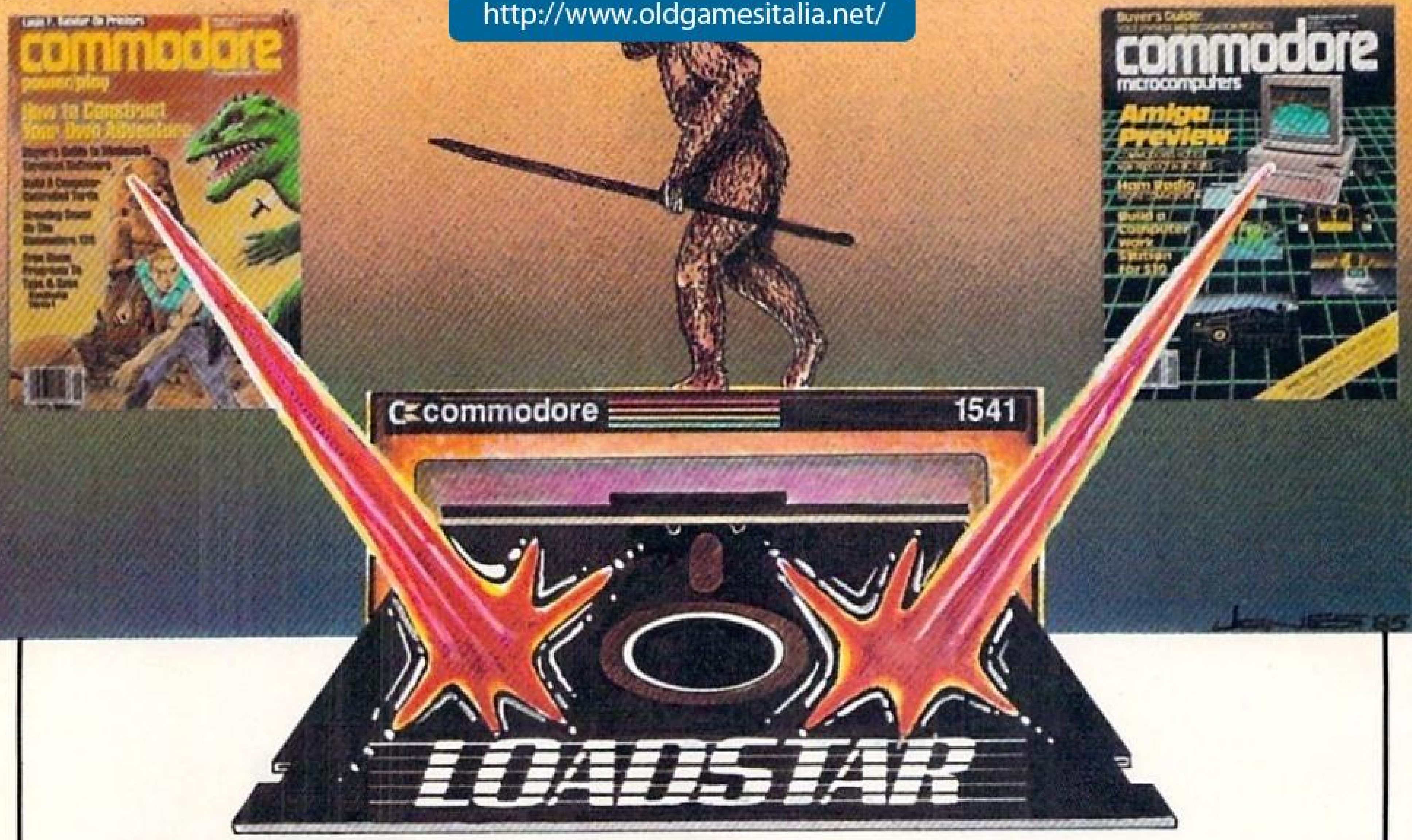

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ADVENTURE ROAD

BY SHAY ADDAMS

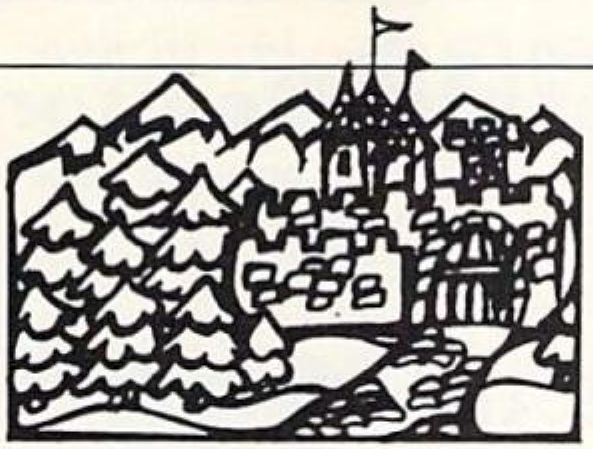
The Most Interactive Game Ever?

News and opinion from a leading explorer of those fantasy realms called adventure games.

If you're tired of collecting objects and figuring out what to do with them, collect yourself a copy of *Nine Princes of Amber*, Telarium's (Spinnaker) adaptation of a fantasy novel by Roger Zelazny. In a first for adventure gaming, virtually *all* the problems are solved by talking to and outwitting people—not fumbling with keys and coins and ropes. As a member of the royal family in the mystical land of Amber, you're ensnared in a deadly struggle for the throne with your eight brothers and three sisters, while your father, King Oberon, is away.

You've got to convince them to back you in a plot to oust the vicious Prince Erik; therefore, *Amber's* problems focus on negotiating with your siblings to form alliances. At your command in this effort is a vast vocabulary of unusual verbs. You can flatter, placate, propose, nod, spit, confess, plead, negotiate, bargain, or choose from numerous other words implemented especially for this intense brand of character interaction. The game also packs an array of nouns, adjectives, and prepositions (all listed in the manual), making it the most articulate of the Telarium adventures.

Adventure games typically have just one successful ending, the other "conclusions" consisting of diverse ways to die along the way. *Amber*, however, has four successful conclusions. The optimal solution is to be crowned King of Amber; the others reflect various degrees of success. (You'll still find plenty of ways to get killed.) Because your interactions with the characters can lead to so many different situations and conclusions, *Amber* is probably the most interactive adventure ever. Another first for the genre is *Amber's* inventive use of graphics. Instead of appearing in full-screen pictures with text below, these ornate illustrations fill the left side of the screen and the text scrolls down the right.



·*Amber* includes a unique game within a game, but it's not an action-style challenge like those in Telarium's early adventures (which have since been removed from the new versions of *Dragonworld*, *Fahrenheit 451* and *Rendezvous with Rama*). It's a visual problem that defies you to fit pieces of a puzzle together by typing in commands. There's also an all-text swordfight sequence that kicks in when you choose to fight instead of talk.

The music and sound effects are outstanding in this and another noteworthy Telarium title, *Perry Mason: The Case of the Mandarin Murder* (reviewed in depth this issue). *Mason* incorporates a similar graphics scheme and also emphasizes character interaction as you assume the role of the famous lawyer who must save his client from a murder rap. Most of the game is staged in court, where you can cross-examine witnesses, introduce evidence, and even object to the district attorney's line of questioning. Success hinges on shrewdly utilizing your staff of two. Paul Drake is a private eye who will dash out and investigate anyone or anything you say, then report back to you in court. Della Street is a legal assistant who will call potential witnesses, summarize the most recent testimony, and suggest effective questions to ask.

The game ends when the jury announces a verdict. As in *Amber*, several possible endings exist, including one in which the real murderer breaks down and confesses on the witness stand, just like in the TV show. If you enjoy "disk drive detective" games, you'll definitely want to investigate *Perry Mason*. Telarium plans to follow it with an Agatha Christie adventure, and, for science fiction fans, Robert Heinlein's *Starman Jones* and *The Moon is a Harsh Mistress*, both scheduled for later this year.

Return to the Land of Zork: *Spellbreaker*

All-text adventurists who haven't already played Infocom's *Spellbreaker* must have been on the moon for the past few months, for it's the long-awaited final chapter in the *Enchanter* series. A maddening jaunt to the magical world of Zork's Great Underground Empire, *Spellbreaker* was written by Dave Lebling, who did *Zork III* and co-wrote *Enchanter*, the series' first installment, with Marc Blank. It commences in the midst of a clamorous meeting of the top Enchanters from around the land. They're debating what to do about an inexplicable phenomenon: Their magic spells either aren't working or completely backfire, and the resulting chaos threatens to destroy the world of Zork. At the height of one Enchanter's speech, the gathering of magicians is turned into newts, frogs, and lizards by a shadowy figure whom you must track down and vanquish.

The trip takes you across the Flathead Mountains to the nest of a giant roc, through cyclopean stone ruins where a monstrous snake blocks your path, to the enigmatic Octagon room and beyond. You're armed with a spell book containing familiar spells like rezrov and frotz. Numerous new spells—jindak to detect magic, blorple to explore an object's mystic connections—soon turn up.

Outside the Guild Hall, you find a strange white cube that, if blorpled, transports you to another location where you'll find several other rooms and puzzles. (This mechanism for traveling about is similar to the way the Improbability drive was used in *Hitchhiker's Guide*.) Other cubes must be retrieved from ogres, hermits, and other characters; each teleports you to a new area. With a top score of 600 points, this is an ex-

Continued on pg. 121

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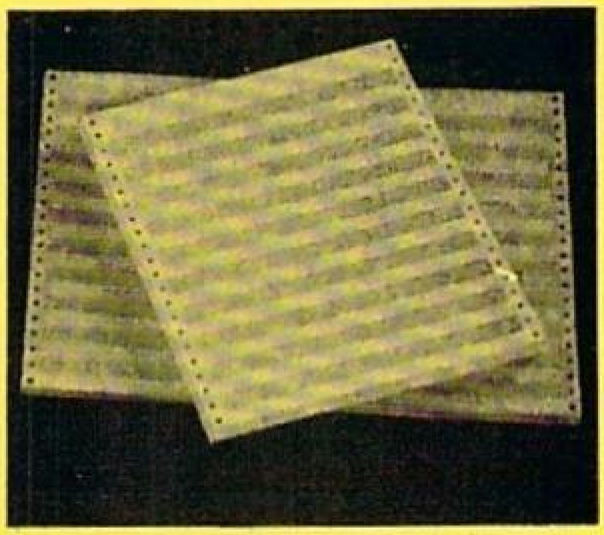

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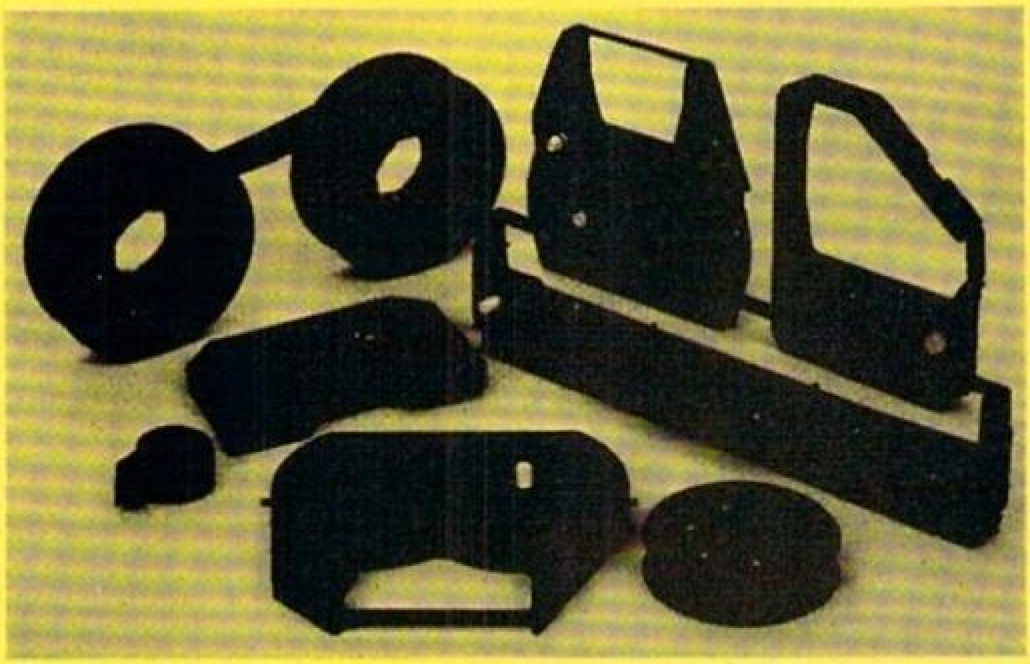

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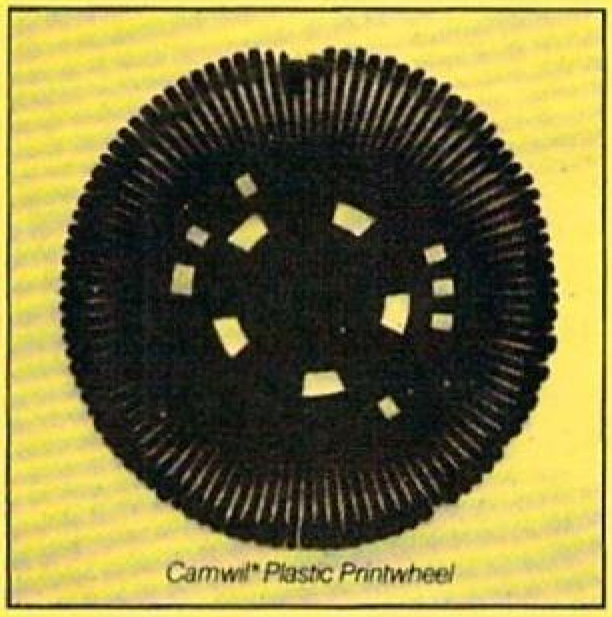

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- **80 character print line at 10 CPI**
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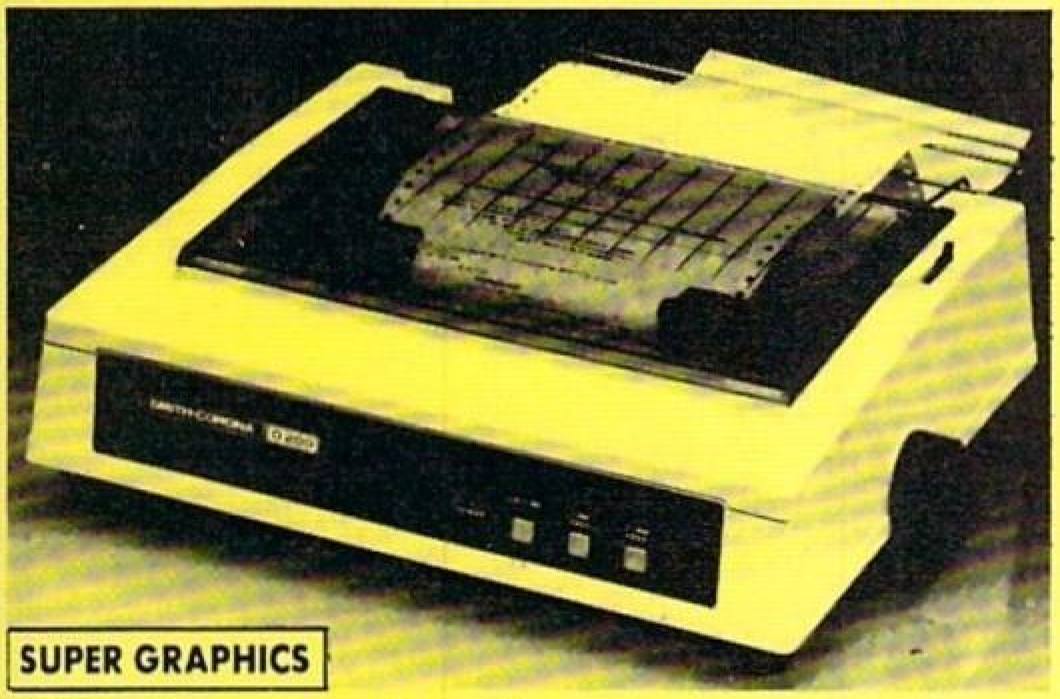
- **Six pitches**
- **Graphics capability**
- **Centronics compatible parallel interface**
- **Features Bidirectional Print, Shortline Seek, Vertical And Horizontal Tabs**



SUPER GRAPHICS

This is a sample of our near-letter-quality print.

emphasized

italic print.

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Check These Features & Prices

120 CPS 10" Printer

List $429.00

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160 CPS + Letter Quality Mode 10" Printer

List $499.00

SALE $199

SPECIFICATIONS

(IBM — Commodore)

(Apple — Atari — Etc.)

Size/Weight
Height 5.04" Width 16.7"
Depth 13.4" Weight 18.7 lbs.

Internal Char. Coding
ASCII Plus ISO

Print Buffer Size
120 CPS: 132 Bytes (1 line)
120/160 CPS Plus LQM: 2K

No. of Char. In Char. Set
96 ASCII Plus International

Graphics Capability
Standard 60, 72, 120 DPI
Horizontal 72 DPI Vertical

Pitch
10, 12, 16.7, 5, 6, 8.3, Proportional Spacing

Printing Method
Impact Dot Matrix

Char. Matrix Size
9H x 9V (Standard) to 10H x 9V
(Emphasized & Elongate)

Printing Features
Bi-directional, Short line seeking, Vertical Tabs, Horizontal Tabs

Forms Type
Fanfold, Cut Sheet, Roll (optional)

Max Paper Width
11"

Feeding Method
Friction Feed Std.; Tractor Feed Std.

Ribbon
Cassette — Fabric inked ribbon

Ribbon Life
4 million characters

Interfaces
Parallel 8 bit Centronics compatible
120/160 CPS Plus NLQ: RS232 Serial inc.

Character Mode
10 x 8 Emphasized; 9 x 8 Standard; 10 x 8 Elongated; 9 x 8 Super/Sub Script (1 pass)

Character Set
96 ASCII
11 x 7 International Char.

Line Spacing
6/8/12/72/144 LPI

Character Spacing
10 cpi normal; 5 cpi elongated normal; 12 cpi compressed; 6 cpi elongated compressed; 16.7 cpi condensed; 8.3 cpi elongated condensed; 5.12.5 cpi elongated proportional

Cartridge Ribbon — List $19.95. **Sale $12.95.**

Interfaces

IBM $89.00	**Apple $59.00**	**Atari $59.00**	**Commodore $39.95**

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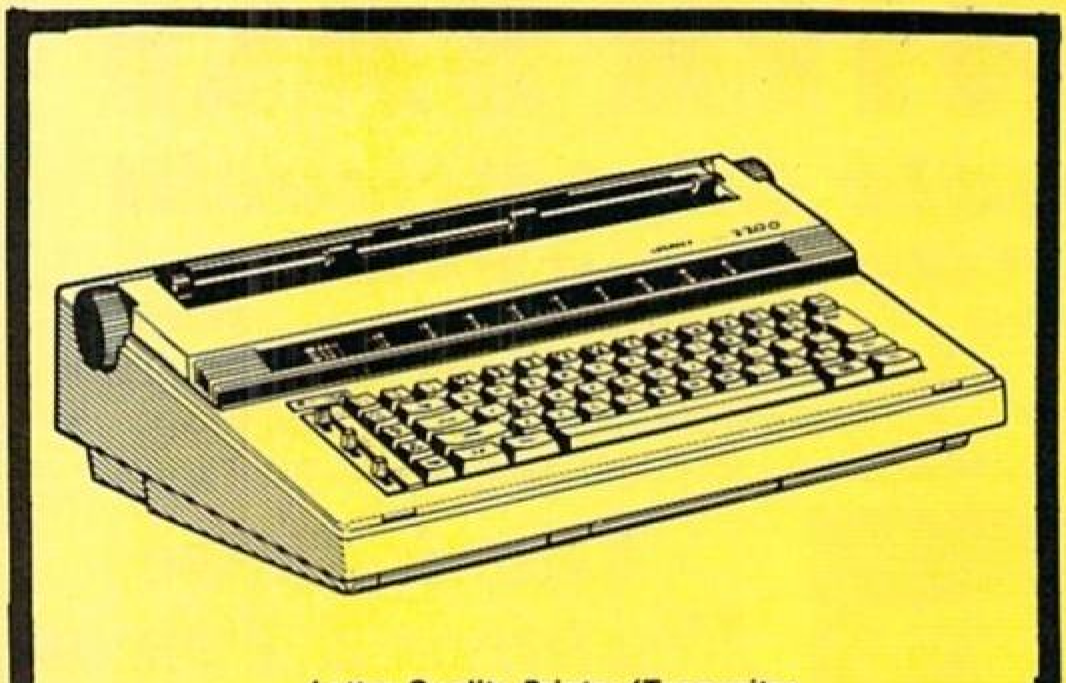
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DELUXE "COMBINATION" PRINTER/TYPEWRITER

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- Two machines in one — just a flick of the switch!
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- Pitch selector — 10, 12, 15 CPI, Automatic relocate key!
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Olympia

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- Precision daisy wheel printing — many type styles!
- Pitch selector — 10, 12, 15 characters per inch,
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Extra Daisy Wheels for Olympia Printers.

Herald Pica (PICA)
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Carroll Pica (COURIER)

$18.95 EACH

Primus 10 (ORATOR)
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ATARI INTERFACE	$59.00
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80 Columns **RGB** Super High Resolution

13" Color Computer Monitor'

*C64/Atari composite cable $9.95

* C128 RGB/Composite 80 column cable $19.95.

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Add $14.50 Shipping

13" RGB & COMPOSITE COLOR MONITOR

Allows use of C-128 and C64 mode - composite and 80 column RGB mode. Must be used to get 80 columns in color with 80 column computers. Specially designed for use with the C128's special composite video output, plus green screen only option switch. (add $14.50 shipping)

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Super high resolution composite green screen monitor. 80 columns x 24 lines, easy to read, plus speaker for audio sound included. Fantastic value. Limited Quantities.

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Turn Your Monitor into a TV Set Without Moving Your Computer

Elegant TV Tuner with dual UHF/VHF selector switches goes between your computer and monitor. Includes mute, automatic fine tuning and computer-TV selector switches. Inputs included for 300 ohm, 75 ohm, and UHF. Can be used with cable TV and VCR's. Fantastic Value. Limited Quantities.

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We are so sure of C-128 Disks that we give you a free replacement warranty against failure to perform due to faulty materials or workmanship for as long as you own your C-128 disk.

AUTOMATIC DUST REMOVER

Just like a record needle, disk drive heads must travel hundreds of miles over disk surfaces. Unlike other floppy disks the C-128 smooth surface finish saves disk drive head wear during the life of the disk. (A rough surface will grind your disk drive head like sandpaper). The lint free automatic CLEANING LINER makes sure the disk-killers (dust & dirt) are being constantly cleaned while the disk is being operated.

C-128 Disks are definitely the Cadillac disk in the world

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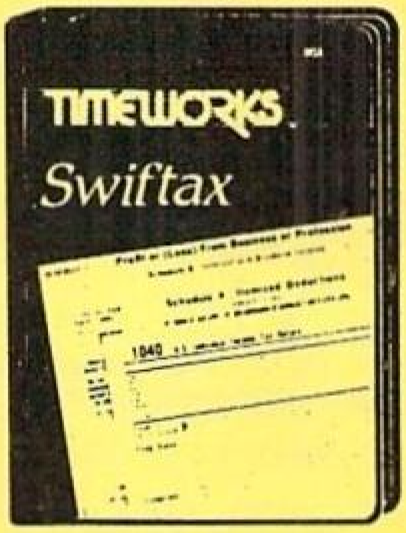

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This program includes:

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Commodore 64

MODEM

Commodore 64

Sale

List $99.00

Sale

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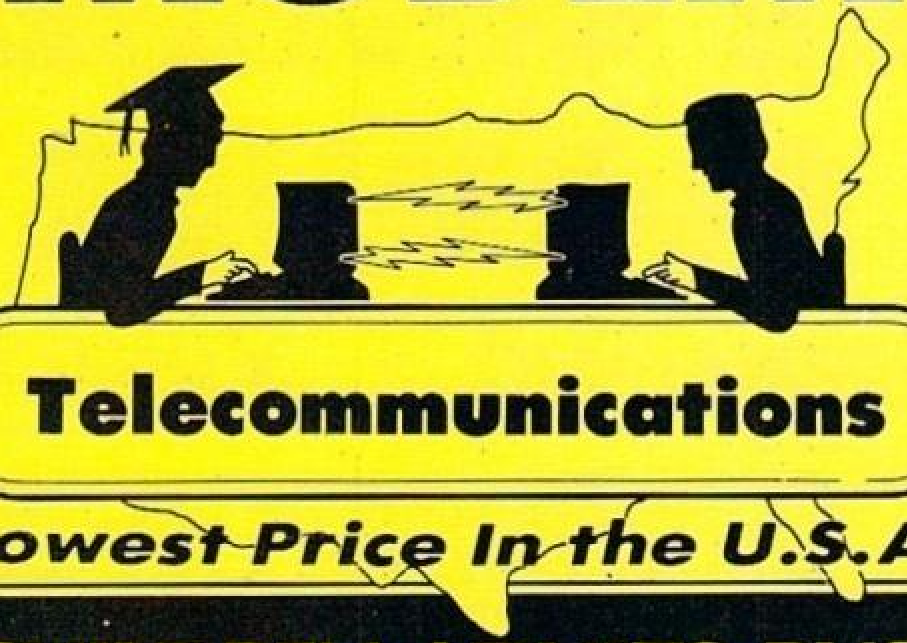
Coupon $24.95



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Commodore 64

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Keyboard Replacement Voice Recognition

The Voice Command Module is a speech recognition device that lets you give commands to your Commodore-64 with your voice instead of a keyboard. This unit converts the sound waves generated when you talk into digital data that is stored in the computer memory. When you speak to your computer, the words you speak are matched against the data stored in memory and the result is converted to an instruction for the computer to perform. This is perfect for programmers and first time users alike. Six programs are included to help you get acquainted with the world of speech recognition.

SOS — Speech Operating System — This is the general utility program which helps you to build a speech file made up of a set of words.

Card File Program — This is a data base much like an index card file which you can control with your voice. You can store recipes, addresses, phone numbers or any kind of information you need to have filed. Up to 100 files may be kept on a single disk.

Aeronaut Game — This game challenges you to land a hot air balloon on 5 different landing pads without crashing into anything or running out of fuel. The balloons altitude is controlled by your voice which adds or removes hot air from the balloon.

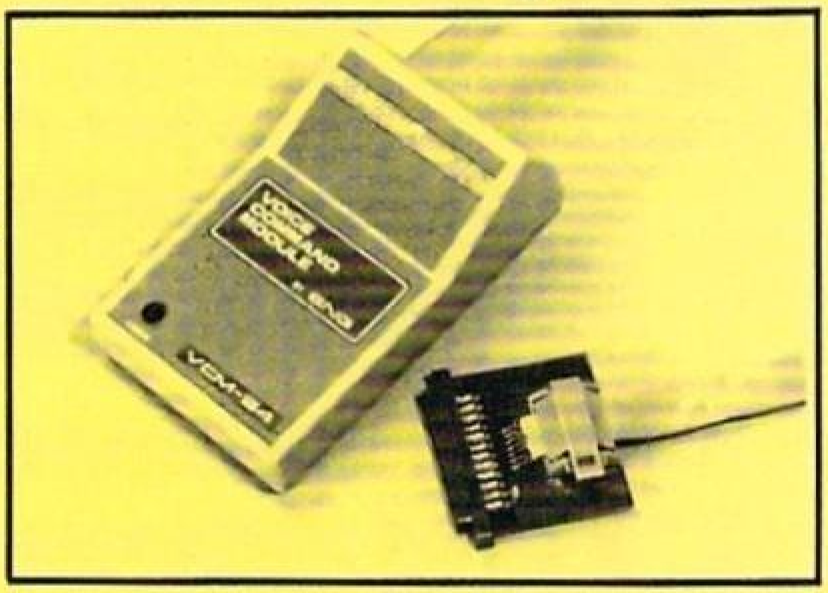
Word Mix Puzzle — Here you must match words much like Concentration. If you guess correctly you win. No hands on the keyboard are needed since the speech recognition unit does the keyboard work from your voice.

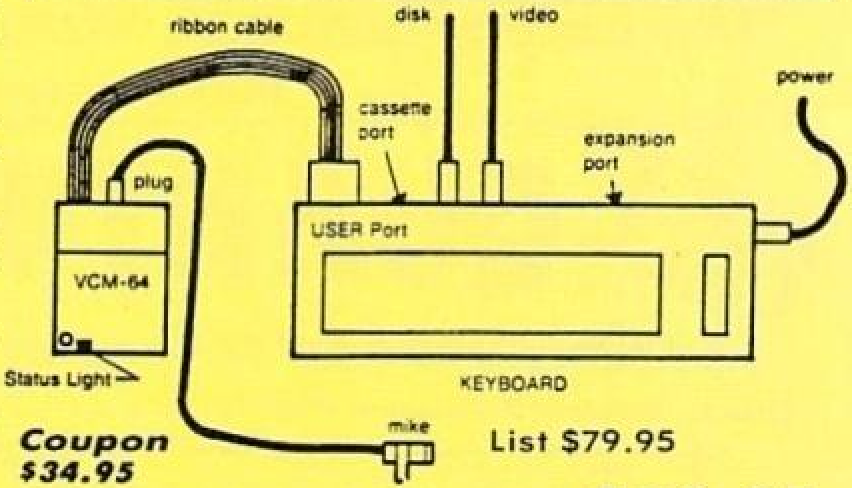
Speech Graphics — Demonstrates how the voice command module works. Here you can graphically see what your speech looks like on the screen.

Demo Program — This is a simpler version of the Aeronaut game that shows you how a simple program is made when listed.

PLUS: You get easy to use instructions for making your own programs in BASIC or machine language using the voice command module.

All Six Programs Included FREE





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Special Introductory Price $39.95

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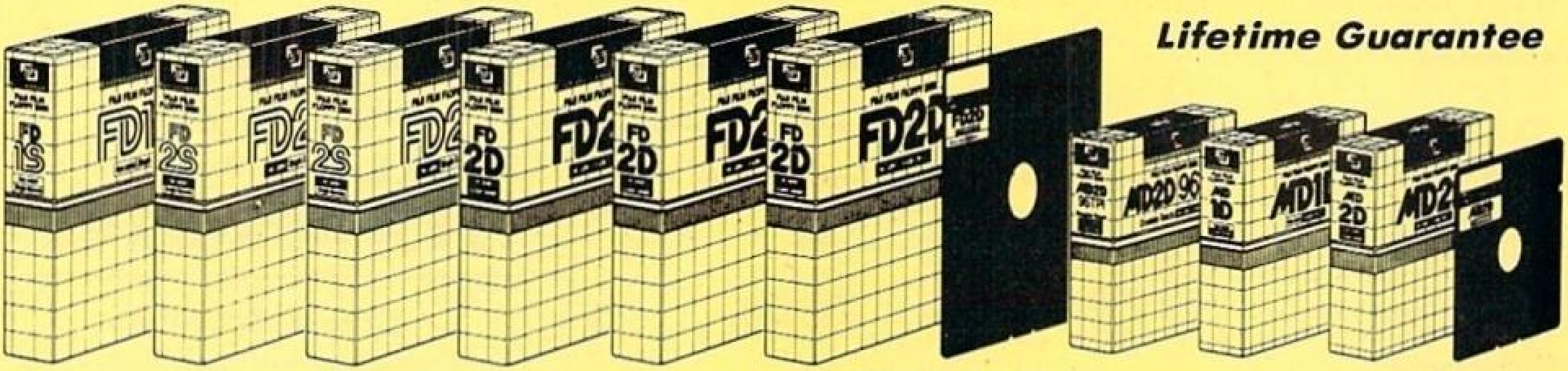

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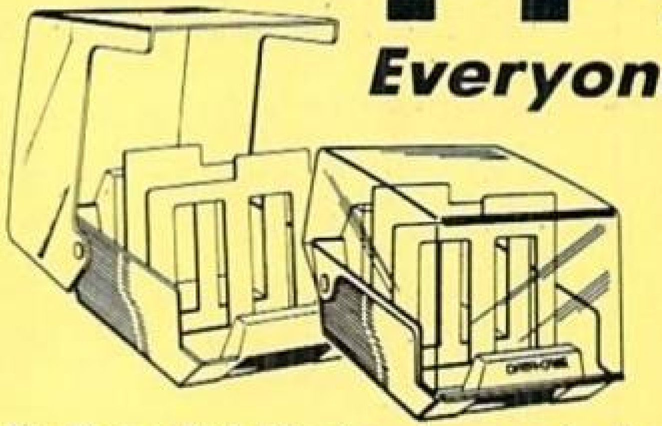

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The Floppy Disk Filer is an inexpensive hard plastic Fliptop case that will allow for easy filing, and protect your disks from dust, smoke, and dirt. Plus, the Floppy Disk Filer will keep all your disks out of unwanted hands and in one place where you can easily find them. **(Holds Over 50 Disks)**

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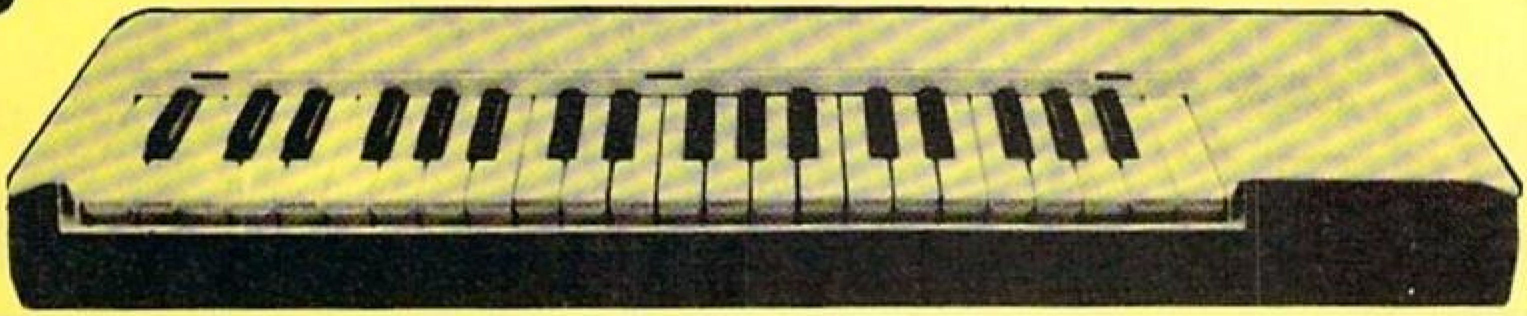

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Recording (with the Conductor) — Three track sequencer (recorder) with over-dubbing and multitimbral (different instrument sounds at the same time) effects.

Interface — Built in interface for Commodore 64, Commodore 128, plugs right in to joystick port no. 2 and user port.

Finish — Table Model in white high-impact material, with carrying handle, protective key cover, and built in music stand. Size 29 1/8x 9 9/16 x 3-11/16, weighs 9 pounds. List $159.95 **Sale $69.00**

The Conductor Software

List $29.95 **Sale $19.95**

The Conductor teaches how a composition is put together, note by note, instrument by instrument. You learn to play 35 pre-recorded songs from Bach to Rock. Then you can compose your own songs and record them right onto your floppy disk.

Teaches:

- Scales
- Bass lines
- Familiar Beginner Songs such as "Jingle Bells"
- Easy classical songs such as "Bach Minuet" and Ravel's "Bolero"
- Advanced classics like "A Midsummer's Night Dream" by Mendelssohn
- Popular hits such as "Thriller"

Create New Instrument Sounds

- Choose from pulse, sawtooth, triangle and noise and sound sources.
- Control the sound envelope with attack, delay, sustain and release times.
- Ring Modulation and Syncronization effects.
- Set Low pass, band pass, and high pass filter frequencies.

Recording Functions:

- Monitor: Lets you use a track to play music live, without recording it.
- Record: Records a track as you play.
- Playback: Lets you hear whatever has been recorded or loaded into the track. You may playback one track while recording another to build layers of instruments.
- Mute: Turns a track off. This is useful when you want to listen to a record one or two tracks at a time.
- Save: Stores a track to the disk.
- Load: Loads a track from disk.
- Protect: Write protects a track.

The Conductor Requires:

- Commodore 64 or Commodore 128 with disk drive.
- The Commodore Piano Musical Keyboard is required to study the reading and playing of musical notes.

The Printed Song

List $29.95 **Sale $19.95**

With the Printed Song program your music can be printed out in music notation, which other musicians can read and play. Any music recorded with the Conductor program can be printed by the Printed Song.

The Printed Song Requires: • Commodore 64 or Commodore 128 with disk drive and printer compatible with the Commodore graphics mode such as the Commodore MPS 803, 1515, and 1525. • The Conductor program.

The Music Teacher Software

List $39.95 **Sale $29.95**

The Music Teacher teaches a beginner how to read music and play it correctly and in rhythm on the musical keyboard.
The Music Teacher will have you reading and playing musical notes in minutes with fun and excitement.

Features: • Trumpet, organ, violin, and synthesizer instrument sounds. • Built in metronome. • Pause/Play control. • Set-up menu for customizing The Music Teacher.

Teaches: • How to read notes on the treble and bass musical staffs. • The names of the notes. • Where the notes are on the keyboard. • How to play whole notes, half notes, quarter notes, eighth notes and sixteenth notes in combinations in both 3/4 and 4/4 time. • How to play in different tempos.

Requires: • Commodore 64 or Commodore 128 with disk drive. • The Commodore Piano Musical Keyboard

The Technician

List $29.95 **Sale $24.95**

Contains programs, and BASIC source listings for reading the Commodore Piano Musical Keyboard, and for reading and creating music files for the Conductor.

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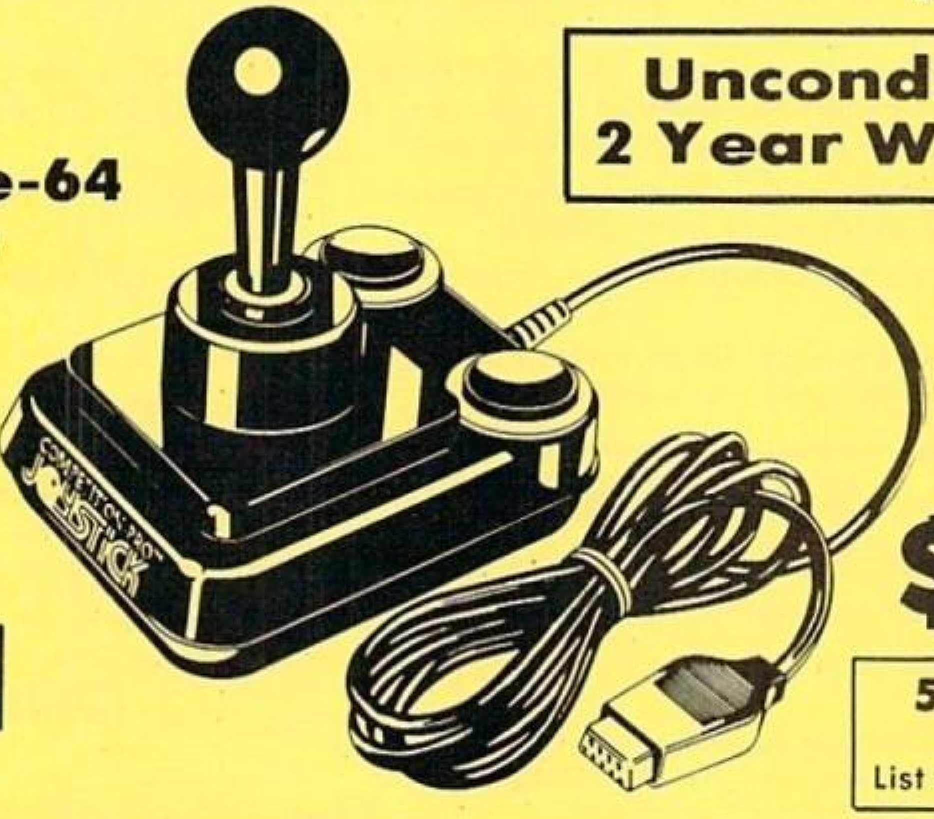

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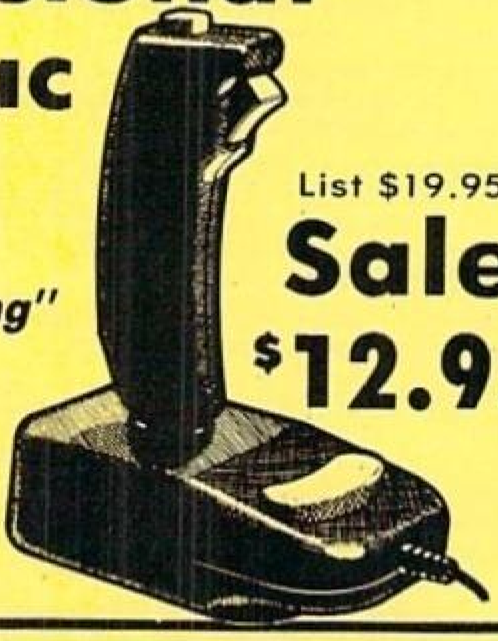

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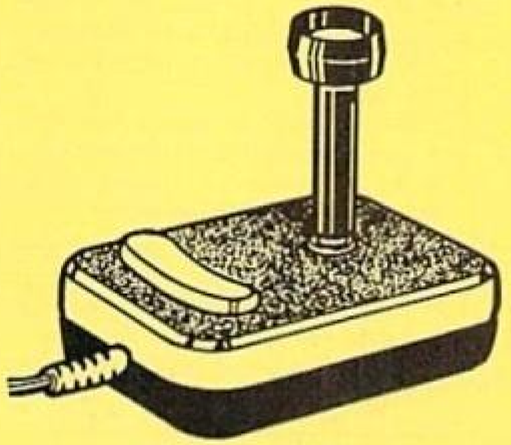

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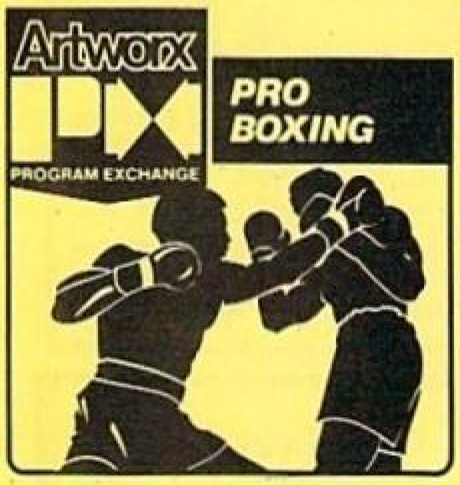

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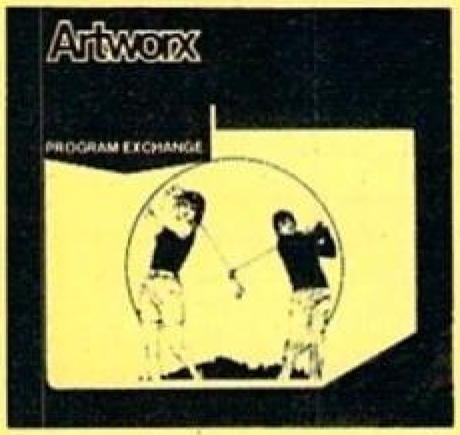
Hole in One Golf — Welcome to the Fairport Country Club where you will be playing on the world famous North Course. Just step up to the tee, select your club, line up your shot and hit away. Hole in One Golf is an authentic golf simulation. It provides complete control over club selection, strength of swing, top-spin or back-spin, even hook or slice! The course is a challenging layout of trees, rough, sand and water traps. If you don't like the course, change it! Use the Course Creator to design and build an unlimited number of courses. Select from over 200 different combinations of fairway, trees, bunkers and water hazards to build your perfect golf course. (Disk) List $10.95. **Sale $8.95.**



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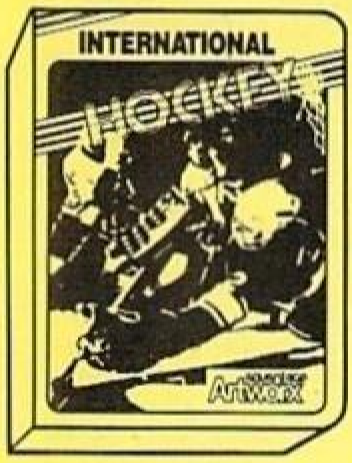

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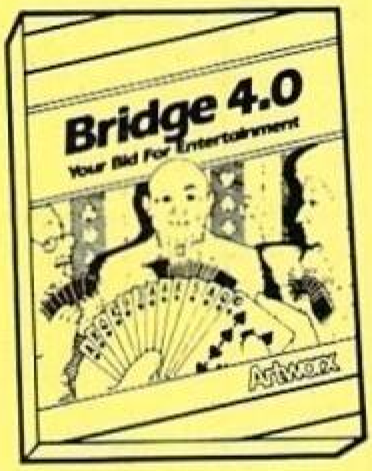
International Hockey — The excitement of cold steel on ice continues with this sensational sequel to the best selling "Slapshot Hockey". Get ready for a real challenge because this is defensive hockey at it's best. Listen to the screams of the crowd as you race for the blueline with one man back. Prepare for tempers to flare, but beware — fighting penalties are dealt with by penalty shots being awarded to each team. Enjoy this highly competitive game with family and friends or play alone against the computer. (Disk) List $24.95. **Sale $19.95.**

Bridge 4.0. A critically acclaimed bridge program. You and your computer partner bid against two computer opponents and play out the hand. The program reviews the bidding, keeps track of the score and tricks taken and will let you know of any illegal bid or play. You can replay interesting hands and you get a continual display of the computer's and your last move. (Disk) List $24.95. **Sale $15.95.**



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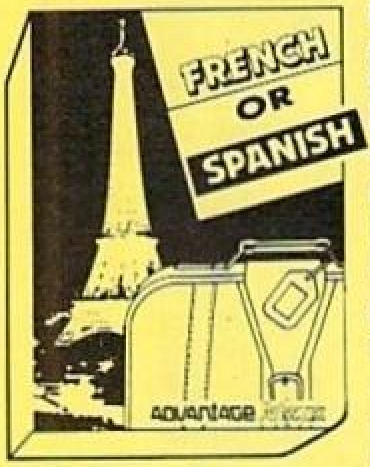

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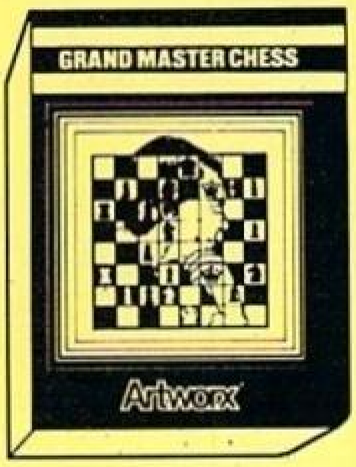
Linkword Language Series. Learn 400 words, basic pronunciation and grammar in just 10 hours. The Linkword language system makes learning fast and easy because of enjoyable teaching methods. The program is based on imagery, linking foreign words to acoustically similar English words. Each package contains an audio tape so you can hear the correct pronunciation of the new words you are learning. Available in Spanish, French, Italian and German (specify). (Disk) List $24.95. **Sale $18.95.** *Coupon $15.95.*

Grand Master Chess. A program with 10 skill levels. Can be enjoyed by the beginner or challenging for the more advanced player. Among the many features of the program is the constant display of the computer and your last move, computer ply, number of moves made and dual timer clocks. Includes a comprehensive opening book and board, background and border color selection. Better than Sargon II and III. (Disk) List $24.95. **Sale $18.95.**



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ColorMe with Rainbow Brite Picture Disk — Your young children can enjoy hours of creativity as they draw and color. They can draw freehand or use predrawn pictures from the Rainbow Brite picture disk included with ColorMe (ltd. qty.) (Disk) List $34.95. **Sale $18.95.**

The Halley Project: A Mission In Our Solar System — Pilots are needed for a top-secret space exploration mission. Only the most skilled will be accepted. To qualify you must pass a series of tests. As you travel through the solar system your only guide is a radarscope and an ability to navigate by the stars. (Disk) List $39.95.
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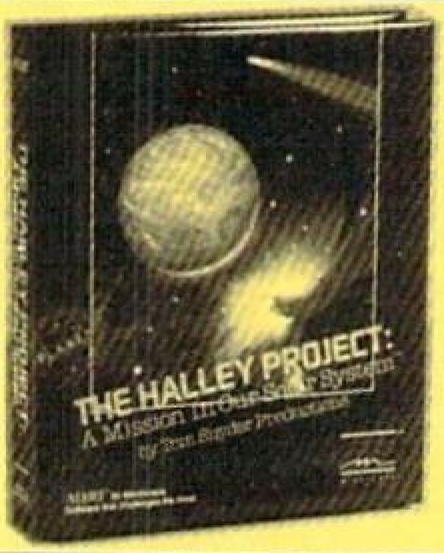
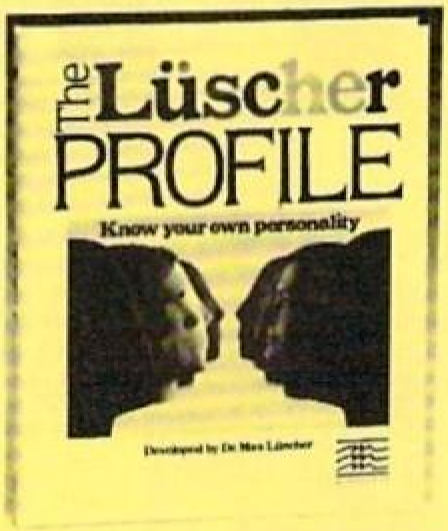


The Luscher Profile — Wouldn't it be great if you could run a personality profile on those who confuse you most? To understand the traits behind the reactions of your spouse, child, parents, in-laws, or best friend? If someone has you in a quandry then this program will help you to answer the probing question, "what makes him tick?" With 35 years of research on the theory of how psychologically revealing a person's color and shape choices can be, Mindscape created the program The Luscher Profile to reflect that discovery. (Disk) List $39.95. **Sale $28.95.**



The Lords Of Midnight — The land of Midnight is controlled by Doomdark and your mission in causing his fall from power is to destroy the source of his strength, The Ice Crown. Battle 32,000 panaramas creatures. Courage and bravery will hopefully see you through. (Disk) List $19.95. **Sale $16.95.**

Quake Minus One — You must stand up to a vicious terrorist group bent on gaining control of the Titan Power Station and causing an extremely destructive earthquake. You have only ten hours to figure out a solution to this probable devastation. First you must destroy four Titan computers, then stop the quake. (Disk) List $19.95. **Sale $16.95.**

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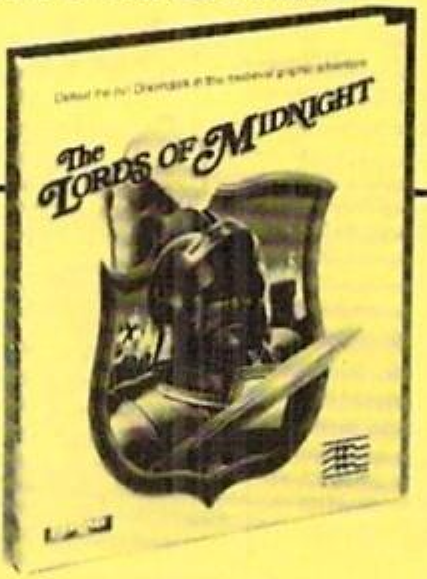

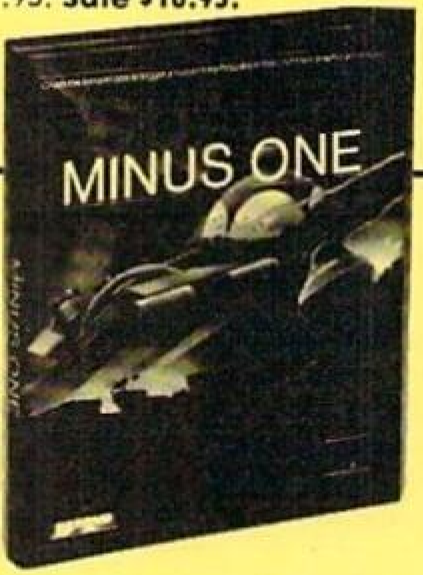

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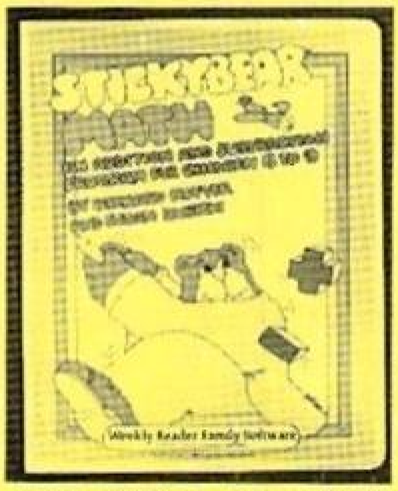
Stickybear Typing — Stickybear makes learning the keyboard both easy & fun for anyone. A 3 game format provides different levels so that as typing skills improve so does the level of difficulty. ***Stickybear Keypress*** is geared to the needs of the child or the beginner, the stress is on the keyboard. To increase typing speed and accuracy the fast-paced ***Stickybear Thump*** will provide a real challenge. ***Stickybear Stories*** allows further practice with real text for timed practice. Everything from jokes, stories and bright amusing graphics make this one of the most delightful typing programs ever, plus you can keep track of your progress and store on disk. (Disk) List $29.95. **Sale $19.95.**

Stickybear Spellgrabber

C64 SALE

Stickybear Typing

SALE C64



Stickybear Spellgrabber — 3 games in one: Picture Spell contains over 200 word/picture combinations. Word Spell is a scramble game, players recreate words shown on the screen. Bear Dunk involves guessing a word to save Stickybear from a dunking. (Disk) List $29.95. **Sale $19.95.**

Stickybear Math — Kids learn math skills as they help the Stickybear Family out of sticky jams. For every set of addition and subtraction problems youngsters get right, Stickybear gets a step closer to getting out of the jam. (Disk) List $29.95. **Sale $19.95.**

Stickybear Town Builder Kids develop essential map skills as they build a town with roads, parks, airports, bridges, etc. and save on disk. That's just the first game. In Take A Drive, Compass-reading and directions are stressed. With Find The Keys, follow clues to locate mystery keys. (Disk) List $29.95. **Sale $19.95.**

Stickybear Town Builder

Stickybear Reading
Weekly Reader Family Software

Stickybear Reading
3 fun activities that build reading comprehension skills. Match The Words: Kids practice vocabulary as they match up word and picture sets. Find The Word: Turns the words in a sentence into animated action. Build A Sentence: Children choose a subject, a verb and an object, then watch them turn into a picture. (Disk) List $29.95. **Sale $19.95.**

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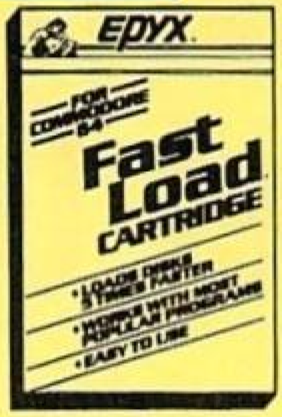
Fast Load Cartridge — Load, save and copy disks five times faster than normal. It plugs into the cartridge port of the Commodore 64 and goes to work automatically loading disks with ease. And that's only the beginning. It can copy a single file, copy the whole disk, send disk commands, and even list directories without erasing programs stored in memory. (Cartridge). List $39.95. **Sale $23.95.**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FOR COMMODORE 64
Fast Load CARTRIDGE
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• EASY TO USE

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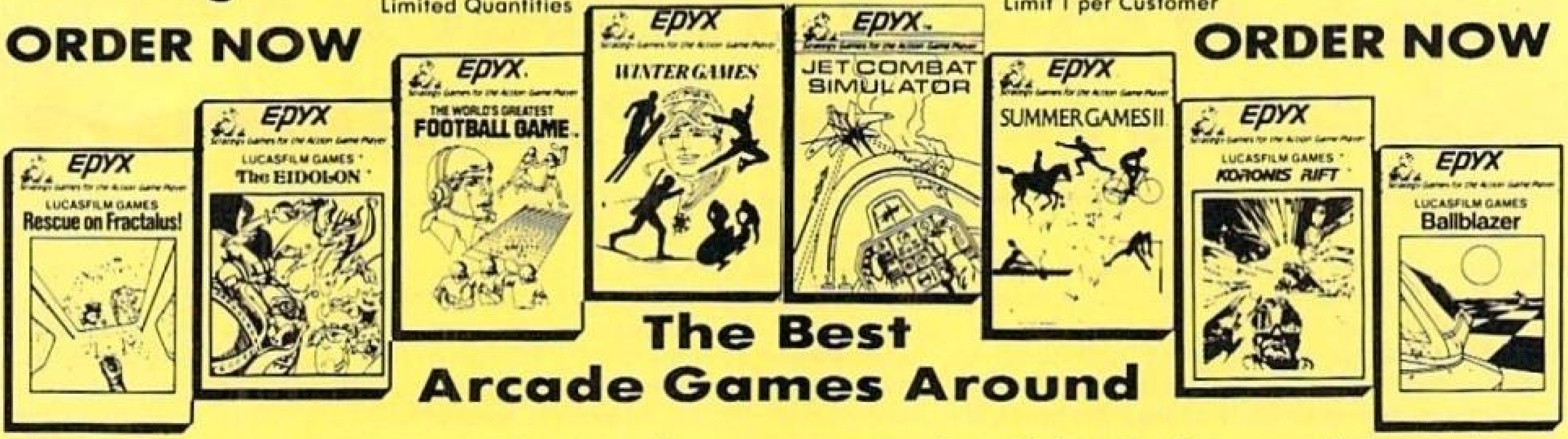

The Best Arcade Games Around

Rescue On Fractalus! — Your mission is to fly your Valkyrie Fighter through the Jaggi defenses and rescue the downed Ethercorps pilots. Sounds easy, but don't let it fool you. It's tough enough just to navigate the mountains and canyons of Fractalus, but try doing it while destroying enemy gun emplacements or dodging suicide saucers. We supply the Long Range Scanner, Dirac Mirror Shield and Anti-Matter Bubble Torpedoes ... YOU supply the skill and guts! One Player. (Disk) List $29.95. **Sale $20.95.**

The Eidolon — The Eidolon is an ancient time machine that transports you to an unusual world. It allows you control over the strange creatures you encounter. You may even change the flow of time. (Disk) List $39.95. **Sale $20.95.**

The World's Greatest Football Game — This one has it all — strategy, action, three views of the field. It's in a class all its own! Finally, a football game that not only puts you on the field, but also on the sidelines in the coach's shoes. Use the "Playbook" or design your own offensive and defensive plays. Then, grab the joystick and put your strategy to the test. You control key players to run a sweep, make a tackle, throw a pass and even kick a fieldgoal. All the action and all the strategy make this your favorite football game. (Disk) List $39.95. **Sale $23.95.**

Winter Games — Experience the challenge of six winter sporting events. In the Bobsled, you're right in the tube careening along the walls. At the SkiJump, you control your form in take-off, flight and landing. In Figure Skating, timing counts for the transitions, the jumps and landings. Choreograph your own routine in Free Style Skating. Hot Dog Aerials push your agility to new heights. The Biathlon challenges your endurance in cross-country skiing. There's even an opening ceremony, complete with national anthems. One to Eight Players. (Disk) List $39.95. **Sale $20.95.**

Jet Combat Flight Simulator — Flight simulation programs are the most requested in the country. The key to a good one is realism, the sensation of being in the cockpit — guiding the plane through take-offs, landings and air to air — air to ground combat. You are an Air Force pilot and your mission is critical. Your success in completing your orders depends on how quickly and accurately you react. Very intense — Fantastic Graphics, animation and control elements. (Disk) List $39.95. **Sale $20.95.**

Summer Games II — The original Summer Games was last Summer's No. 1 seller. Carry on the tradition with another chance to "Go for the Gold!" Introducing Summer Games II with 8 new Olympic events including Kayaking, cycling, fencing, diving, track & field, gymnastics and equastrian. The excitement of Olympic competion is present in this new version as it was in the original. Great graphics and sound effects. This one's a winner! (1 to 8 players). (Disk) List $39.95. **Sale $20.95.**

Koronis Rift — The setting is a remote planet surrounded by radiation. To discover the secrets of the Ancients you must battle alien guards. For protection you must obtain weapons from the ruins of interplanetary civilization. (Disk) List $39.95. **Sale $20.95.**

Ballblazer — Unique split-screen, 3-D graphics give you and your opponent a first person view of the field of play. You race across the playfield in your Rotofoil trying to capture the ball and fire it through the goal before your opponent. The winner is the player with the most points at the end of the timed competition. Hold onto your joystick and keep that finger on the fire button, this is the type of two player head-to-head action you've been waiting for. Two Players. (Disk) List $29.95. **Sale $20.95.**

Super Graphics

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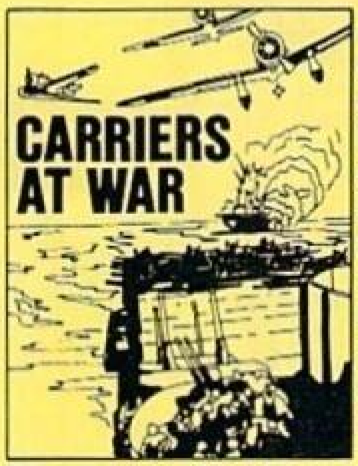


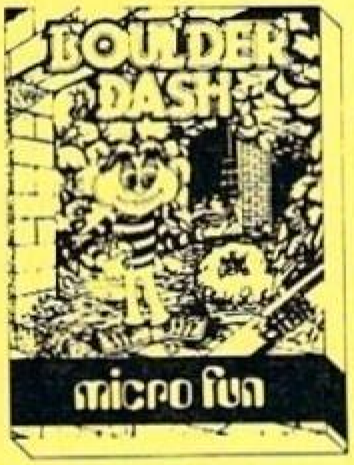
Carriers At War — Recreate five crucial battles of WWII, or make up your own. Play the role of the great leaders such as MacArthur, Halsey and Yama-moto. There are 7 built-in battles such as Pearl Harbor and Midway and you must face the same challenges that arose in the original battles. Accurate battle conditions, including intelligence reports, speed of movement and fatigue levels. (Disk) List $42.95. **Sale $32.95.**

RAY TOBEY'S
SKYFOX

Sky Fox — Fly the unfriendly skies in this incredibly realistic flight simulation program. You are fighting to protect your home base with five kinds of weapons and working gauges. The high speed animation and breathtaking graphics are up to arcade standards. Features 5 skill levels and 15 different scenarios, each requiring a different strategy. This best selling game is a sure winner. (Disk) List $29.95. **Sale $23.95.** *Coupon $22.95.*

EUROPE ABLAZE

Europe Ablaze — A strategy program with you as the commander of the air force. Planning the bombing missions, plotting the course and setting the speed. The geography and weather conditions are historically accurate. Design your own scenario to keep the play exciting. Will you change the course of history? (Disk) List $42.95. **Sale $34.95.**



Super Boulderdash — The exciting sequel to one of the most action packed strategy games ever. With 16 new maze levels, so complex and challenging that you will soon become a fan. The original was an award winner with characters like the enchanted wall and the boulders that fall when you least expect it. You must find the way through the caves while gathering jewels, all the time working against the clock. (Disk) List $29.95. **Sale $22.95.**

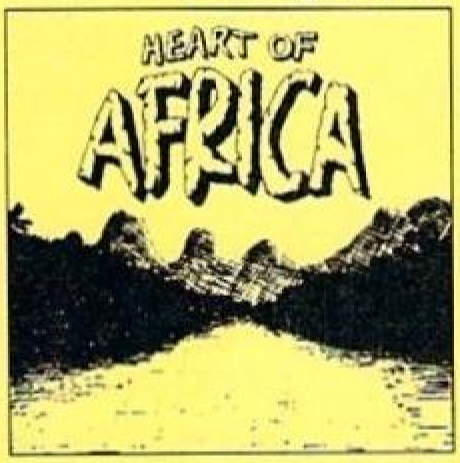
Commodore 64 SALE

Action — Graphics

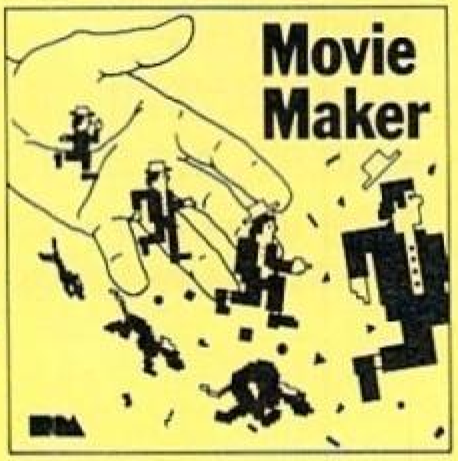
Touchdown Football — Enjoy football all year long with this fast action program that brings all the elements of the game to your home computer. It's all here, the realism of great graphics and sound that put you on the turf with the NFL all stars. 100's of plays for both the offensive and defensive teams, plus the ability to play a game against another fan or the computer. (Disk) List $29.95. **Sale $22.95.**

Racing DESTRUCTION Set

Racing Destruction Set — Put yourself behind the wheel of the vehicle of your choice, build the racetrack and add the obstacles. Then prepare for the race of your life. This split-screen, computer slot car racing set is for two players. You'll encounter oil slicks and weapons and have to be on guard for ice, and hairpin turns. (Disk) List $29.95. **Sale $22.95.**



Heart Of Africa — The exiting sequel to "The Seven Cities Of Gold" has you exploring the Dark Continent in the 1890's. Your mission is to find the lost temple of Ankh-Ankh. You'll encounter cannibals, slave traders, hunger and wild animals, to name a few. Historically and geographically accurate, so you gain education as you have fun. (Disk) List $29.95. **Sale $23.95.**



Movie Maker — Create your own animated movies complete with sound effects. Animate your own drawings or select from an endless supply of built-in pictures. After you're finished, save your creations on disk. Up to six characters per movie and 10 built-in movies to let your imagination run wild. (Disk) List $29.95. **Sale $23.95.**

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DELUXE VIDEO Construction Set

By Matthew Leeds

The title floats in space, rotating on three axes. When it reaches midpoint in one rotation, it changes into a different title. The credits float up from off camera, and then an eight-point grid pattern wipes across the screen to show the first picture, a house in the suburbs. We zoom into the house, in steps. Then another wipe, this time from the side, shows a different house. We pull back (reverse zoom) until the house becomes a point on the horizon. It then fades and a logo comes up onscreen, zooms, splits, and fades through the color spectrum to black.

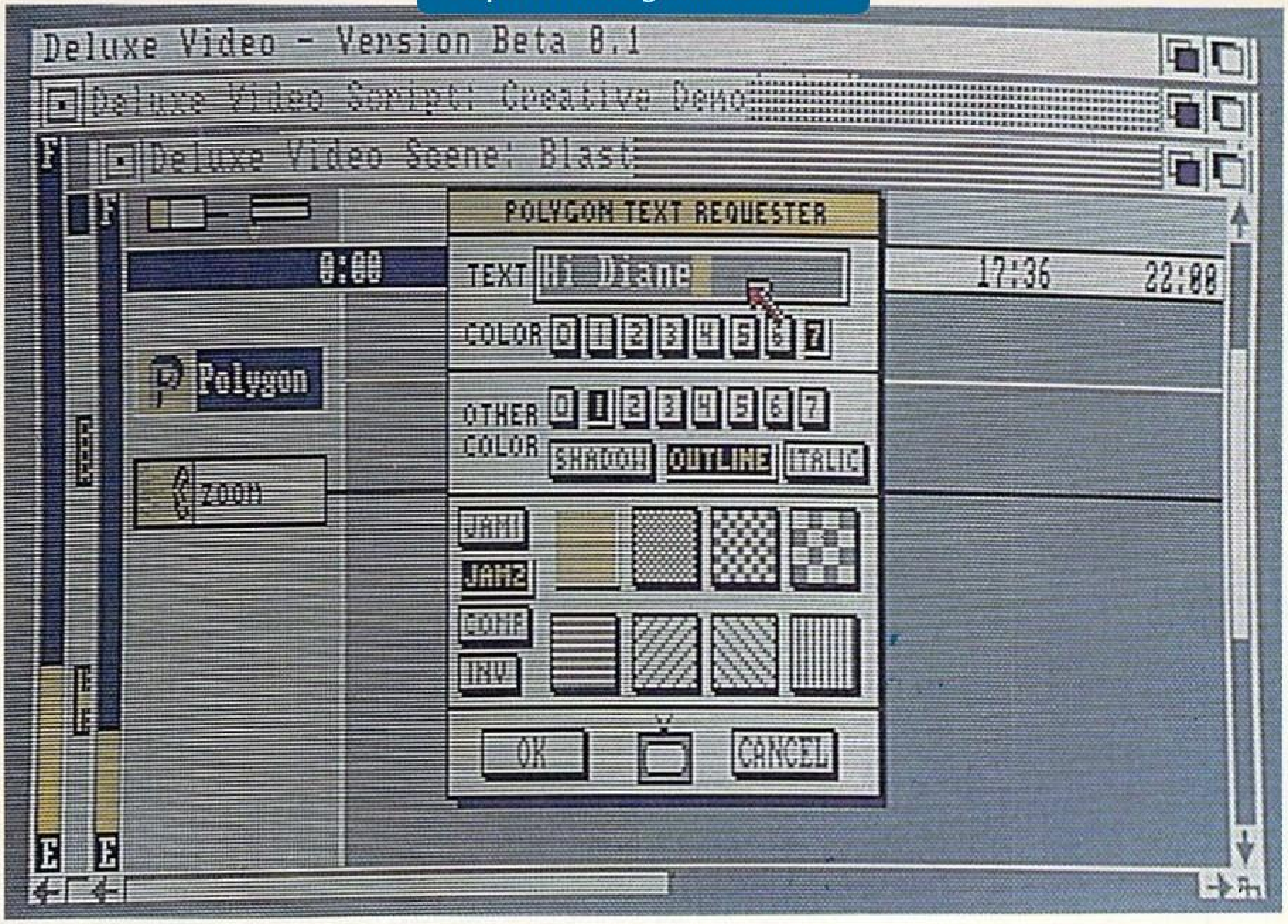
This new "video processor" for the Amiga from Electronic Arts can be used to create professional-quality, customized home videos, business presentations, point-of-purchase displays, animated commercials, and just about anything else you can think of.

This is not a description of a prime-time real estate ad, or the opening of a feature film. It is one of the demos that will be on the *Deluxe Video Construction Set* from Electronic Arts, the graphics package for the Amiga that lets you make computer-generated videos just like the big boys do. *DVCS* enables you to take images from a variety of sources and combine them into a single computer-generated output. Pictures from EA's *Deluxe Point,* images from the Amiga frame grabber, music from *Deluxe Music Construction Set* and other programs can be used to create custom home videos. Animations, titles, business presentations, and special effects suddenly are in reach of the home and small-business market.

DVCS consists of two disks. The Maker/Player disk lets you create a video and play it back. The Player disk, on the other hand, will only play a video. The Player disk is unprotected, and must be copied to any disk that contains a video you've created. This allows you to give away copies of the videos you design, and to create free-standing videos that can be enjoyed by anyone who owns an Amiga.

This is such a visually oriented program that it is difficult to describe how it works using only words. One image that comes to mind is that of a graphics "spreadsheet," with each event in the video on a separate row, stacked in layers. Another is that of a film-cutting bench, with pieces of scenes to be cut and pasted into place.

The starting point is a blank slate, called a script. On to this script are layered tracks. There are five types of tracks: Video, Background, Foreground, Control, and Music. On to each type of track you place Effects. Time runs from left to right across the tracks, and the time for an Effect to occur is controlled by the two arrows attached to its box. These arrows are movable, so you can set the time an Effect starts and ends. Each Effect has its own requester [controller]. For instance, the


Deluxe Video - Version Beta 0.1
Deluxe Video Script: Creative Demo
Deluxe Video Scene: Blast
POLYGON TEXT REQUESTER
COLOR 0 1 2 3 4 5 6 7
OTHER COLOR 0 1 2 3 4 5 6 7
SHADOW OUTLINE ITALIC
JAM1 JAM2 COMP INV
OK CANCEL
0:00 17:36 22:00
Polygon
zoom
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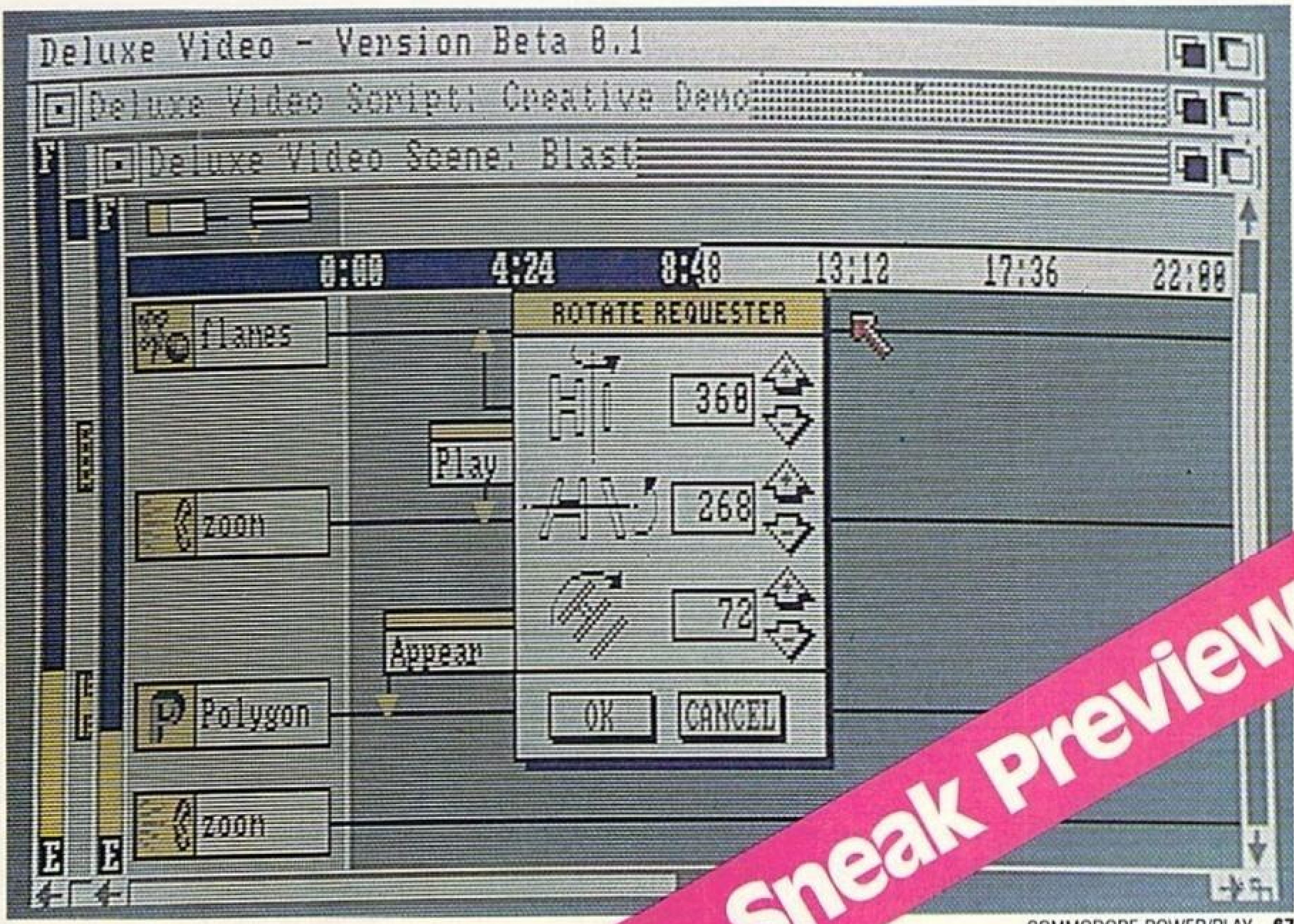
TEXT Hi Diane


Deluxe Video - Version Beta 0.1
Deluxe Video Script: Creative Demo
Deluxe Video Scene: Blast
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OK CANCEL
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flames
Play
zoom
Appear
Polygon
zoom
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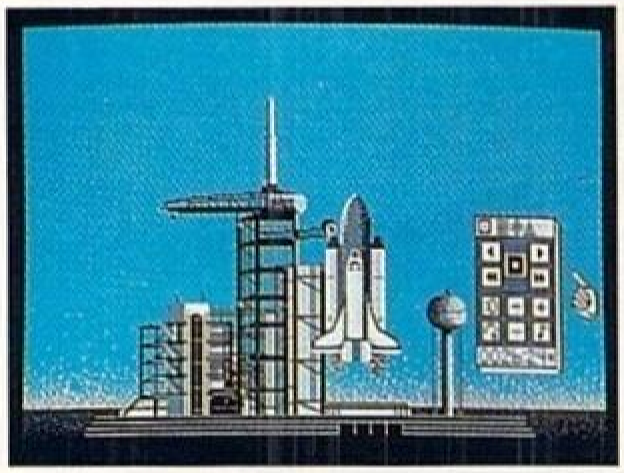
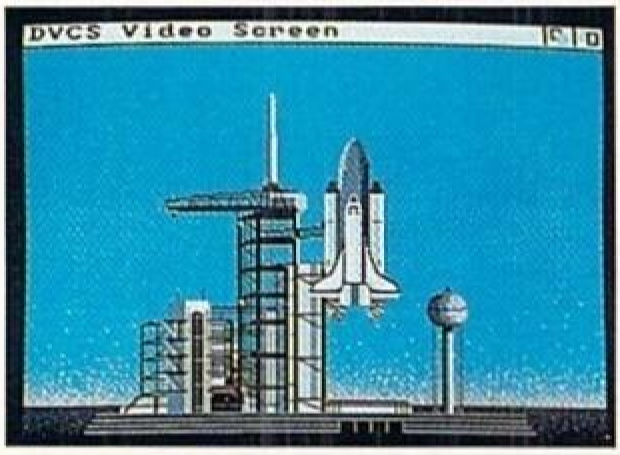
Sneak Preview:

wipe Effect requester has several options: up, down, left, right, diagonal, grow from a point, break up in horizontal positions. The sound Effect requester controls the sounds using slider controls. Stereo movement [pan], pitch of sound [rate], and volume, are some of the changes that can be made to the library of sounds included in *DVCS.* There are a great number of other Effects that can be used as well. For instance, there are requesters for size, appear, disappear, move, fade, strobe, rotate, animate, and a variety of other Effects.





Background tracks are full-screen pictures. They may be created using a paint program like *Deluxe Paint,* or the Amiga frame grabber. Backgrounds are brought on using an "appear" Effect, and can be manipulated using various wipes or other Effects. Foreground tracks control objects of less than full-screen size. There are quite a few Effects available, as well, for the control of objects.

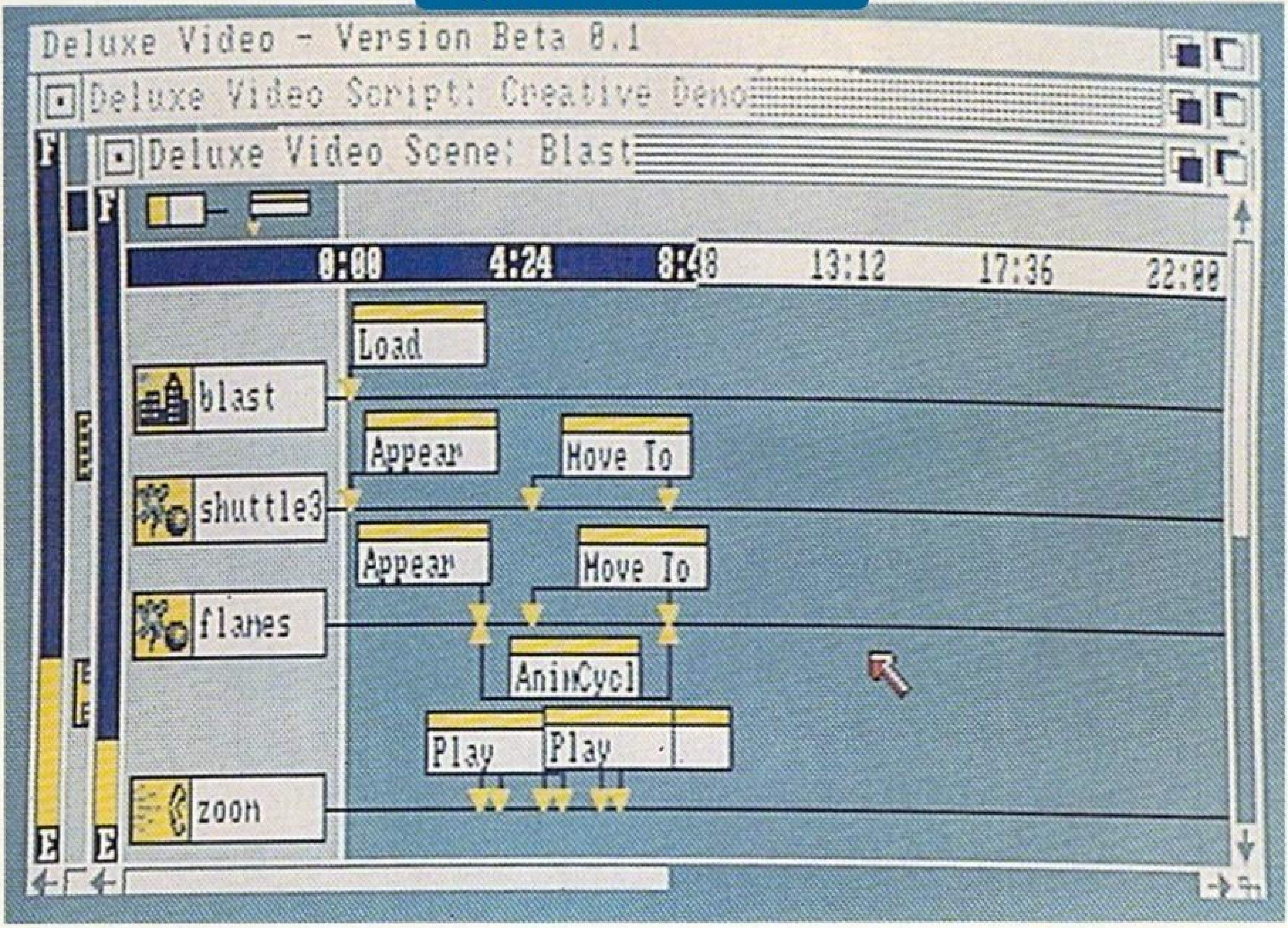
Music tracks are mostly self explanatory. *DVCS* will accept music from most Amiga music programs, or if you are going to record your video on a VCR you can dub music from any source onto the tape.

Since this is a preview of a program that was still under development at the time this article was written, some features were still being worked on. Without going into great detail on each, however, let's look at some of the other features in *DVCS.* But keep in mind that this is not meant to be a complete list of all the functions that are in the finished product.

DVCS can display eight colors in the background, and eight in the foreground. Controls for modifying the colors allow you to change the red, green, and blue component of any color on the screen using slider controls. Several sets of pleasing color combinations are included, and you may create and store your own, as well. There is full support for the system fonts, or additional fonts created later, and a custom font known as Polygon Text, used for larger text displays and text rotations. The program will recognize a second disk drive, for additional data storage, and plans are under way for support of hard disks and RAM disks. Templates for exploding pie charts, bar charts, slide shows, and scrolling titles, are included in the final release, as well as several full-length demo videos. Finished videos can be set to keep repeating, or to branch off and call other videos. Full access to the Amiga Workbench is also supported.

An animation tool, called Framer is also included in *DVCS.* This allows you to assemble various objects into step animation sequences. *DVCS* also accepts animation sequences from other animation programs, as long as they adhere to the IFF standard.

What can you use *DVCS* for? To start, it makes great title sequences for home videos. It also can be used for business presentations, stand-alone point-of-purchase displays, self-running demos, electronic message boards, low cost animated TV commercials, flip charts, animated storyboards, and slide shows. Since it can be set to respond to keyboard commands, it could be used to create simple interactive video teaching programs. Think of it as programming language for graphics on the Amiga, or as a videoprocessor—a "word processor" for images that outputs video instead of text. Imagine CD-ROM based libraries of clip art, animation sequences, and sound effects for *DVCS.* Imagine a new kind of desktop publishing revolution, using images instead of text. That's what *DVCS* can be used for.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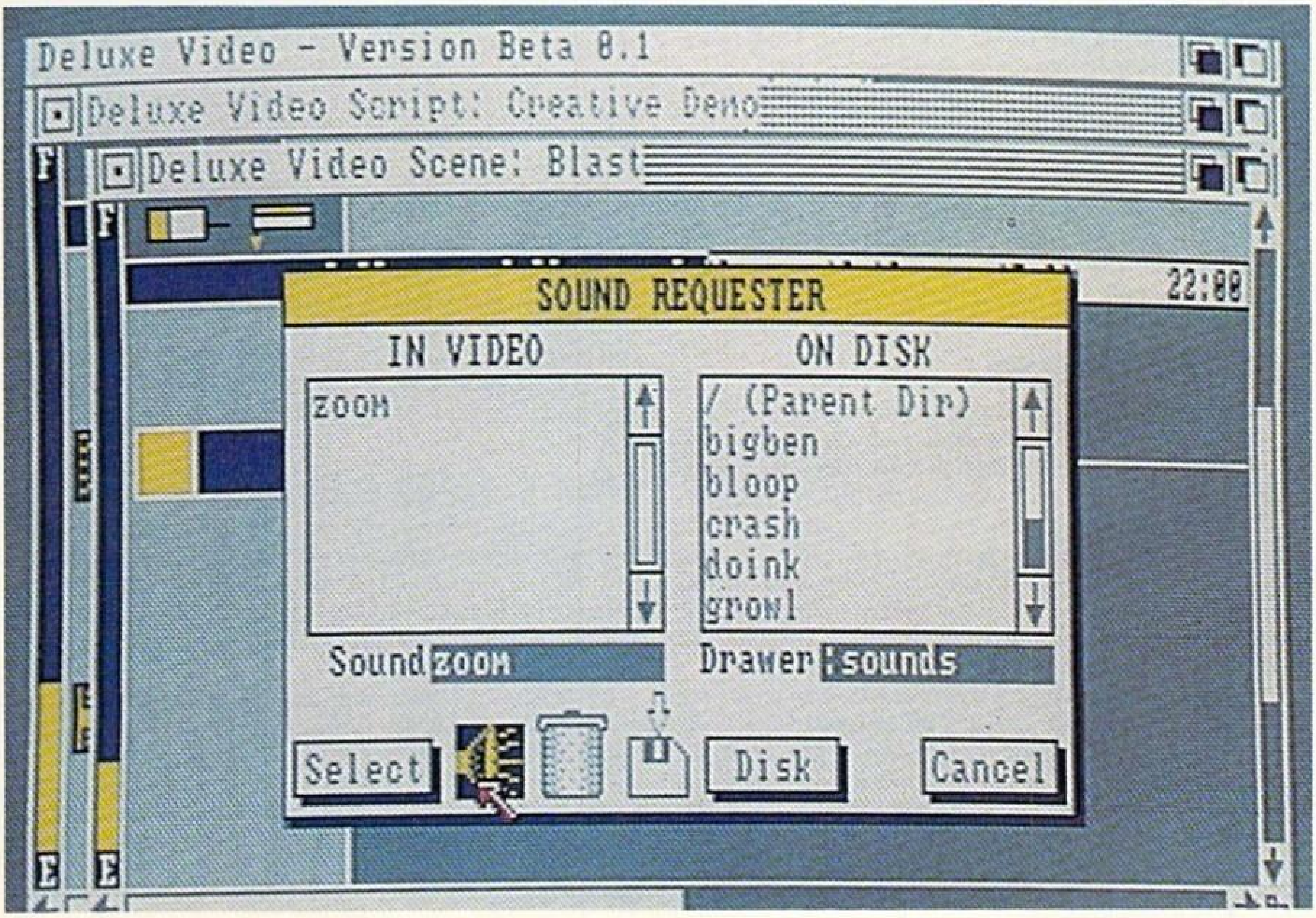
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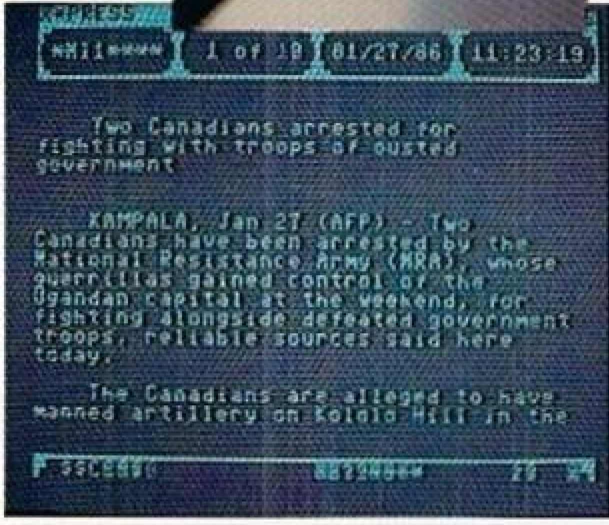

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     Two Canadians arrested for
fighting with troops of ousted
government

     KAMPALA, Jan 27 (AFP) - Two
Canadians have been arrested by the
National Resistance Army (NRA), whose
guerrillas gained control of the
Ugandan capital at the weekend, for
fighting alongside defeated government
troops, reliable sources said here
today.

     The Canadians are alleged to have
manned artillery on Kololo Hill in the
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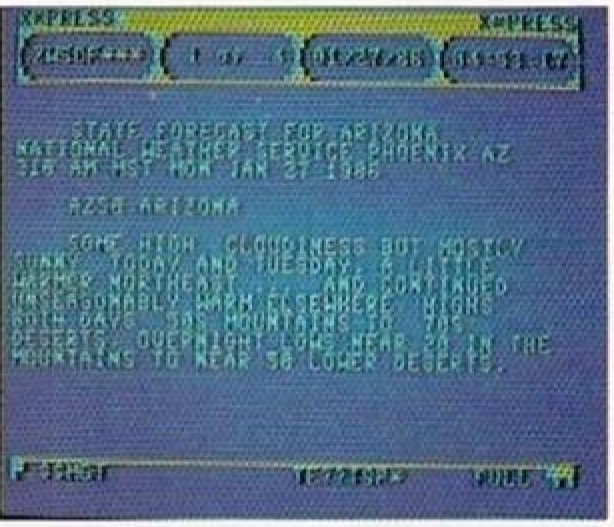

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     AZZ50 ARIZONA

     SOME HIGH  CLOUDINESS BUT MOSTLY
SUNNY  TODAY AND TUESDAY. A LITTLE
WARMER NORTHEAST ... AND CONTINUED
UNSEASONABLY WARM ELSEWHERE. HIGHS
BOTH DAYS  50S MOUNTAINS TO 70S
DESERTS. OVERNIGHT LOWS NEAR 20 IN THE
MOUNTAINS TO NEAR 50 LOWER DESERTS.
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YOUR DIRECT LINE TO THE WORLD

by Diane LeBold, Editor

It's finally happening. Now you can get news (including news direct from the Soviet Union and People's Republic of China), stocks, sports, entertainment, weather, book and movie reviews, and more — up to the minute, hot off the wire — information that would cost you up to $20 an hour on business-oriented telecommunications services.

But there's no modem, no phone, no connect charges. And, at 9600 baud—a data transfer rate that's far quicker than anything you've seen so far for your Commodore computer — there are no long waits, either.

All you need is your Commodore 64, 128, or Plus/4, an inexpensive cartridge and — here's the trick — your cable TV connection. The only cost, once you have the cartridge, is a low monthly fee — around $19.95, depending on your local cable company.

It's Available Now

It's called X*PRESS, it's available now in over 20 metropolitan areas in the U.S. and Canada, and will eventually be available wherever there's cable. So if you need your information while it's still warm and kicking, this is where you can get it for virtually pennies. Even if you're just an interested bystander who likes to keep up with current events, X*PRESS gives you access to the kind of information you never get to see in the traditional media — for about the same money you'd spend on a daily New York Times or Wall Street Journal and a few magazines each month.

For instance, how many of your friends can tune directly into OPECNA, the news service of the oil-producing nations of the world—or TASS, the Soviet news service—and get information "in the raw" as it comes over the wires? Some of that information may appear in a few hours—or maybe tomorrow—on TV or in the newspapers. Most of it will never even hit the streets.

According to McGraw/Hill, one of the sponsors of X*PRESS, consumers get to see only about 20% of the enormous amount of news and information that travels the international airwaves every day. With X*PRESS, however, you can get information direct from 3000 news sources around the world—so you aren't limited to just the usual UPI and AP stories. It's a real education, for instance, to read the news that comes through on Xinhua (People's Republic of China), and then compare it to the same story as it comes in on UPI.

You can also monitor up to 16 stocks at a time—and be only 15 minutes behind what's actually happening on the floor of the exchange. Or check the latest price of copper. Or get the score on that Sixers-Celtics game just minutes after it happens. Or check the ski conditions in Aspen before you make the trip. It's still $19.95 a month, no matter how much you use it—which for many people will seem like something short of a miracle, considering that a stock-monitoring service alone can cost up to $20 an hour on traditional networks.

What X*PRESS Is Doing

Every minute of every day, news and information services in every nook and cranny around the world are transmitting all kinds of information. The information is put on a kind of enormous electronic carousel, where it keeps cycling—old stories eventually dropping off, new being constantly added—24 hours a day.

Newspapers, TV networks, and other traditional media pull information off the carousel as it speeds by, decide which of it they want to use, edit it, and get it out the door as fast as they can. But, because of the constraints of time, space, and money, only a small amount of the total available information ever reaches the general public. And, of course, there is a significant time delay between the original transmission of the information and the time it finally gets broadcast or printed.

X*PRESS, in short, lets you bypass these middlemen and pull stories off the carousel yourself. You select the kinds of stories you want X*PRESS to grab, from among six main categories—News, Weather, Sports, Business and Finance, Entertainment, and Features—and you narrow down your selections using sub-menus within each of the main categories. For instance, from within the Sports category, you might want to monitor only basketball stories. Or you might want weather in only Pennsylvania. Eventually you may also be able to pull in local information, as well, which will be transmitted by your local cable company.

Once X*PRESS stores the information in the computer's memory, you can search through it using keywords or combinations of keywords. You can throw out the articles you don't want to keep and print out the ones you do. It's all copyrighted material, so you can't distribute exact copies of the information to anyone else, but you can use that information for any other purpose.

How You Use X*PRESS

There's nothing hard about using X*PRESS—no phone numbers to dial, no secret passwords, account numbers, or protocols to learn. Just plug an X*PRESS cartridge into your computer, plug your cable TV line into the cartridge using a special connector, and fire up the computer. Voila, there's X*PRESS on-screen, ready to go. You don't even have to own a disk drive to use it—although a drive can be handy. It's completely menu-driven, with a simple manual and handy help screens. You can't crash it, and even if you did, it wouldn't matter, because you can just start over without incurring any extra charges, and any data you might have lost as a result can easily be re-captured.

Let's take a brief tour to help you get a feel for what you can do with X*PRESS. From the Main Menu, go first to Category Selection. This is where you tell X*PRESS what kinds of information you want it to grab off the carousel. If you plan to keep monitoring the same categories over and over, you can save your selections to disk, so they become the default categories when you load the program. (You can, of course, change these defaults at any time.) Or you can choose new categories each time you load X*PRESS and change them whenever you like.

After you select the main categories you want to watch—say, Sports and News—you can narrow down the field even more. So, if you want to keep tabs just on baseball and TASS, you can choose those categories from the Sports and News sub-menus.

Once you've made your selections, X*PRESS immediately starts looking for information—but only for those specific selections. So, for our example categories, the program would store only the baseball stories that whiz by, for instance—not any soccer stories, or track and field stories. X*PRESS will continue to pull in relevant information until your computer's memory is full—at which time it will tell you it's full, and will stop storing information. On the unexpanded Commodore 128 you can store about 80 stories. On the 64, you'll get about 30 to 40 stories before your memory is full.

Now we get to the point of all this—reading what X*PRESS has captured. Suppose, for example, all you really wanted to know about baseball was how the Phillies are doing in their game against the Cubs. From the Main Menu you select Keyword Setup and enter "Phillies." Then go to Information Display, get into the baseball section, and, what do you know, the first thing you see is a story about how miserably the Phils are getting whupped in Chicago.

If your memory is full and you want to make room to store more stories, you can print this story out on paper and then delete it. Or simply delete it without printing it. X*PRESS will immediately start watching for more information from your selected categories and catch it on the fly.

Let's get serious for a minute and suppose you're interested in watching several stocks you've invested in. In this case, choose the Market Monitor Setup option from the main menu and enter the ticker abbreviations for the relevant companies. X*PRESS goes to work instantly, and in a few minutes you can view the bid and ask prices, the high, low and last prices, and the number of transactions for each of your selections. In addition, you can see at a glance how the prices for the last eight transactions have fluctuated (up, down or same). This information will always be no more than 20 to 25 minutes old, and that's a "worst case" situation.

And If You're Really Attached to Your Modem

Next year, X*PRESS plans to have a feature that will make your modem a handy appendage, after all. Say, for instance, that you want to read the latest reviews of new books on the market. X*PRESS will not only give you those reviews, it will also give you an opportunity to buy the books—via your modem. You'll just press a key to go into communication mode, and your modem will autodial a local Telenet phone number. There you'll be prompted to enter ordering information for the item you want to buy.

The Future of X*PRESS

Soon after you read this, an Amiga version of X*PRESS will probably be available. The wonder of this version is that it will let you run X*PRESS in the background, while you use your Amiga for other things. That means you could, for instance, be writing a report on current events, and be able to talk about events that are taking place at the very moment you're writing the report. That's about as current as anyone could hope for.

In addition, you can anticipate that cable companies will start to offer local information and special services as soon as they can. And who knows, maybe someday you'll be able to print X*PRESS stories to disk and call them up as word processor files, so you can adapt them to suit your own applications, or just save them for future reference.

How to Get X*PRESS

X*PRESS is presently turned on in the following cities: Honolulu, Hawaii; Indianapolis, Indiana; San Francisco and Oakland, California; Salt Lake City, Utah; Madison, Wisconsin; Topeka, Kansas; Summit County, Vail, and Broomfield, Colorado; Billings and Helena, Montana; Portland and Corvallis, Oregon; Bremerton and Bellingham, Washington; Amsterdam, Plattsburg, Binghamton and Ithaca, New York; Manchester, Vermont; Baltimore County and Howard County, Maryland; San Antonio, Texas; Sioux Falls, South Dakota; and Toronto, Ontario.

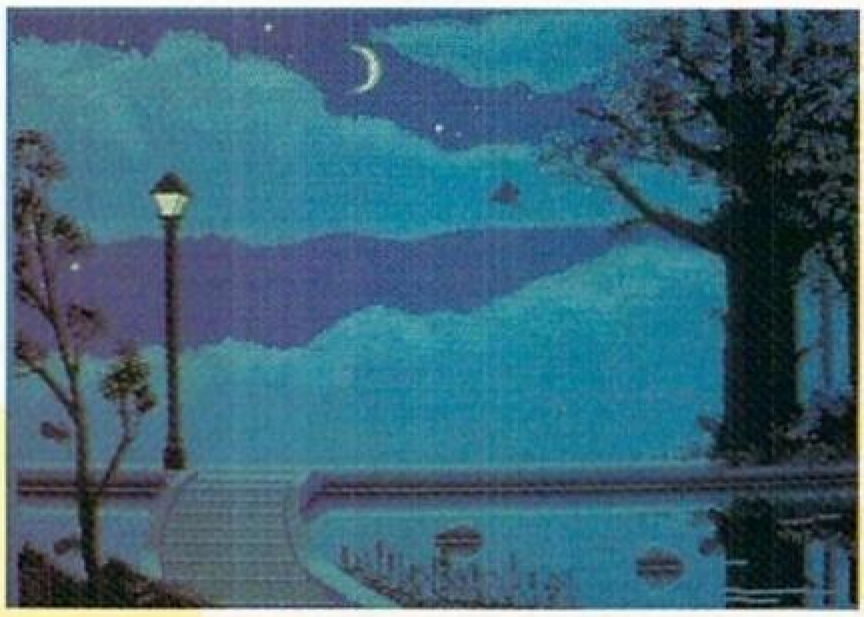
In May, Vancouver, British Columbia, is scheduled to be turned on and in July, Wichita, Kansas.

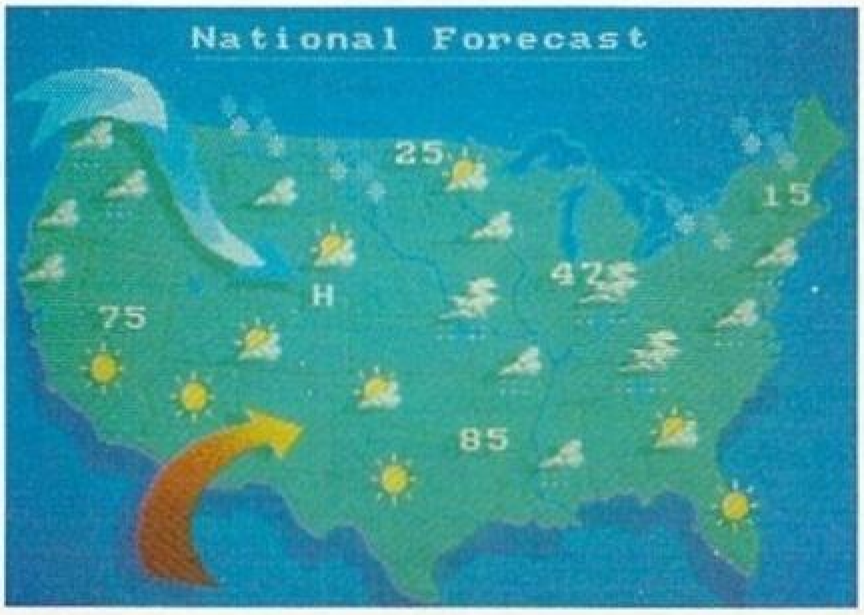
To find out how to get X*PRESS, call your local cable company.

USING GRAPHICRAFT

The Amiga's Introductory Painting System

by Louis R. Wallace





The first program you buy for your Amiga may well be **Graphicraft.** This easy-to-use drawing and painting system is probably one of the most common programs found in Amiga software libraries. It is very good for first-time users who may be new to computer paint packages, and allows you to draw in the Amiga's 32-color 320 × 200 graphics mode, using pop-down menus and the two-button Amiga mouse. It can be used in either 256K or 512K mode.

Graphicraft's six main functions are found in menus available at the top of the screen. From the PROJECTS menu, you access the program's non-graphics functions, like loading and saving screens and brushes. This menu option also lets you clear your picture from the screen, or print it out on any printer—black-only or full-color—supported by Amiga Preferences. Since Preferences comes set for Epson printers and serial output, you must change the Preferences to reflect your printer type, if it differs from these default values.

A word of warning to 256K Amiga users. Before you print out your picture, be sure it is saved to disk. This is because after you have printed it, you will be required to reset the Amiga and reload **Graphicraft** to continue painting. Any picture in memory will therefore be lost.

To load a previously saved picture, you can choose OPEN from the PROJECTS menu, or you can simply type in the picture's name. Being able to type in the name is an important feature because it lets you use the AmigaDOS file prefixes to load from subdirectories or even other disk drives.

Because there are two options for saving a picture using the PROJECTS menu, you have a certain amount of flexibility in working with your pictures. The SAVE option within the PROJECTS menu replaces any picture with the same name. The SAVE AS option allows you to create different versions of the picture without erasing the original. This option also allows you to save a different disk or subdirectory by prefixing the picture name with the AmigaDOS drive number or directory name.

If you are working on a picture that has already been saved, and you make changes that cannot be corrected by using UNDO, you can use REVERT from the PROJECTS menu to cause the picture to be reloaded. This saves you a couple of steps, and a bit of frustration.

Graphicraft's SHAPES menu gives you access to the program's five basic drawing options: freehand, lines, rectangles, fill and text. You turn off one option by selecting another, and can change drawing colors by going to the COLOR menu.

The Rectangle selection allows you to make boxes quickly. Just choose where you want a corner to be, click the mouse and move to the location of the opposite corner. The box will grow, changing shape as you move the mouse (a technique called "rubber-banding"). When you have it just the way you want it, click the mouse again and the

Producing *Vermeer Girl* Using *Graphicraft*

by Sheryl Knowles, Senior Graphic Artist, Commodore-Amiga

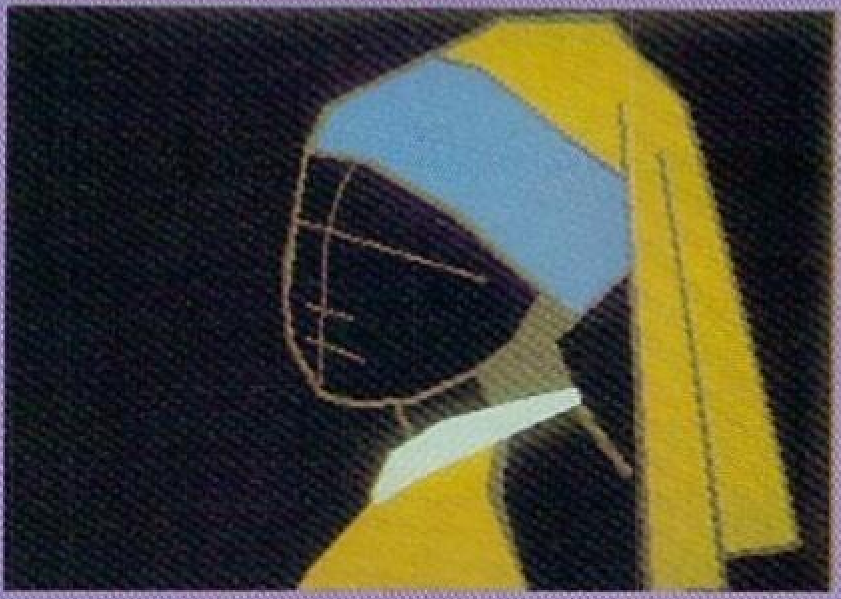
Since a computer monitor shows images of colored light, I decided to pay tribute to a painter who was a master of creating the illusion of light—Johannes Vermeer.

In the first stage, I set up an initial palette, and, using Line-Draw and Fill, roughed out the picture. I used two brushes: a three-by-three rectangle and a single pixel.

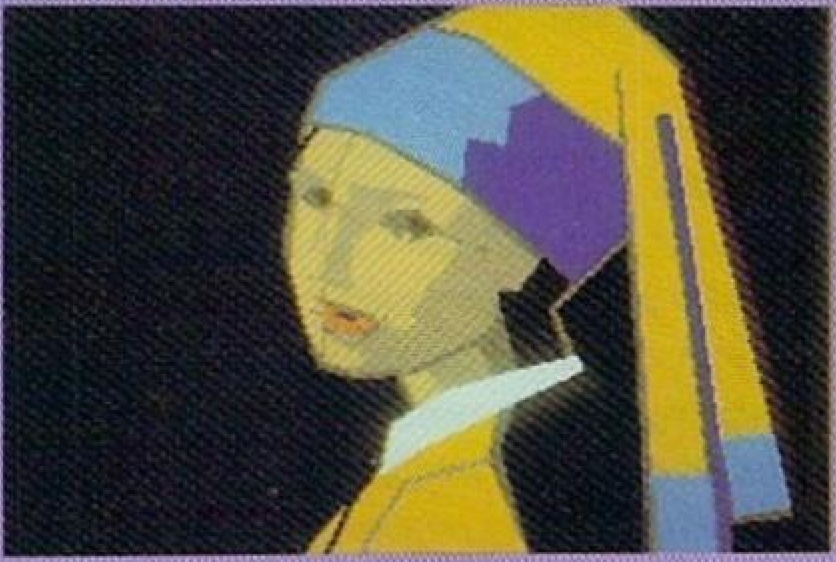
Next I continued blocking the major areas of light and shadow with color. The results are the second image shown on the right.

To create the third image, I switched to Freehand Draw and various "loose pixel" brushes to create a more "painterly" feel. I also modified my color palette at this point.

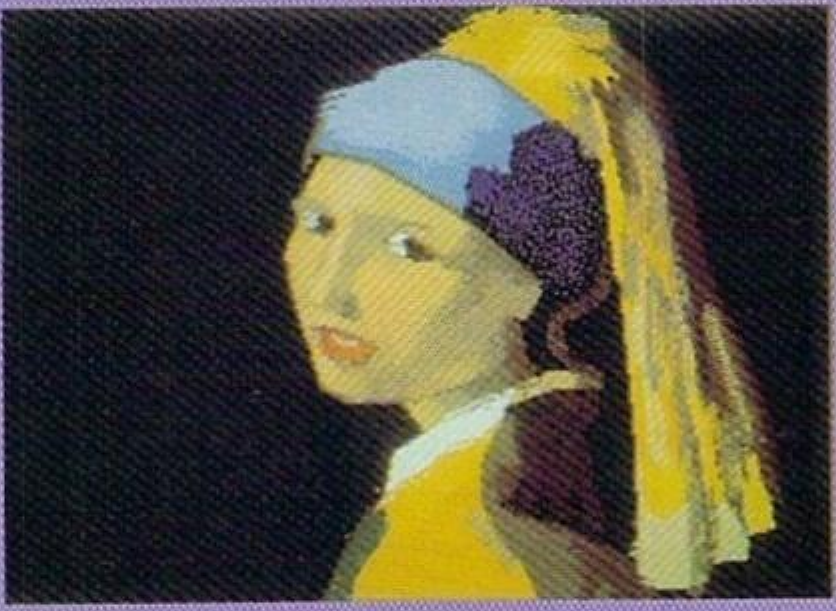
Finally, over a period of two more days I worked almost entirely in Magnify-Pick Position mode, one pixel at a time, to smooth curves and add detail, especially around the eyes. I created new brushes to re-work the clothing and the earring, and modified the color palette again to soften shadows. The final results are shown in the bottom image on the right.



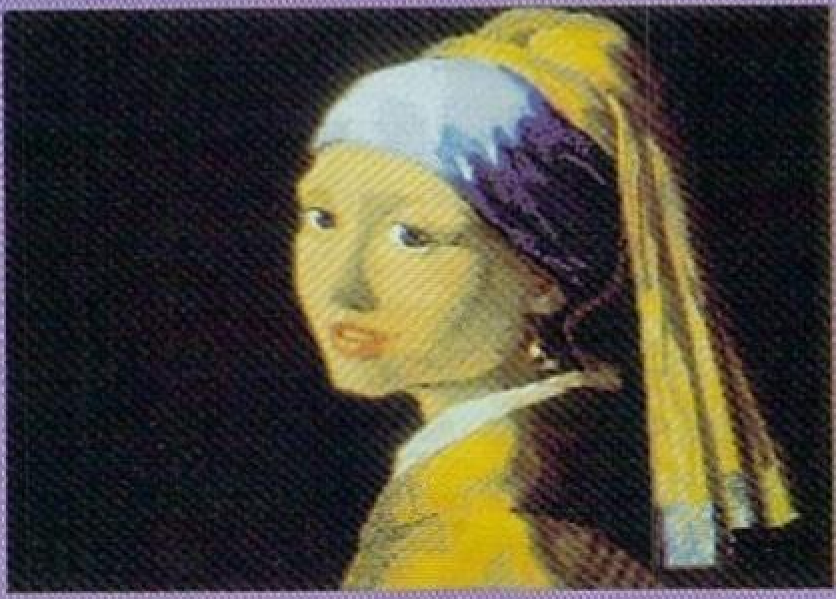
First, I roughed out the picture using Line-Draw and Fill.



Next, I blocked in major areas of light and shadow.



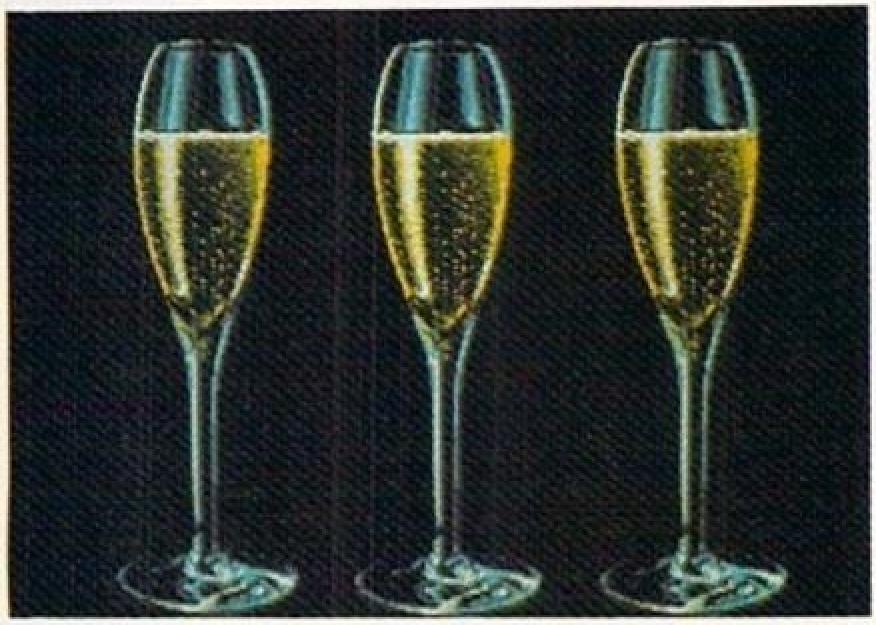
Third, I switched to Freehand Draw and "loose pixel" brushes, and modified the color palette.



Finally, over two more days, I worked on the details using Magnify-Pick Position mode to complete the image.

USING GRAPHICRAFT

Graphicraft is an easy-to-use graphics program that inexpensively introduces you to drawing and painting on your Amiga.



rectangle will be drawn.

The Line option in the SHAPES menu lets you make perfectly straight lines between two selected points. If you want to fill the interior of a shape, choose the Fill option. When you move the pointer to the inside of the area to be filled and click the mouse, the area will quickly flood fill with the color you have selected. But be careful that the area is completely enclosed, or the fill will leak out and could completely cover the screen.

You can also put text within your picture using the Text option from the SHAPES menu. The program gives you a choice of two sizes of text and three different ways to present it on the screen.

From within the BRUSH menu, you choose from among 16 pre-made brushes. Additional libraries of different brush shapes can be maintained on disk, and, in fact, an extra library comes with the program. To design your own brush shapes, choose Custom Brush from the BRUSH menu. This is a small graphics editor that allows you to make different patterns (in one color) to be used as brushes and save them for re-use.

The COLOR menu offers 32 different colors to be used as your drawing color. You can also create your own custom color palette by selecting Change Palette from within this menu. Using the Change Palette option, you can change or copy colors or create an entire range of colors that is totally different from the original palette. You modify the color palette using three "slider gadgets" that control the red, green and blue color signals to mix any of the possible 4096 colors the Amiga can produce. Using these sliders is very similar to mixing paint pigments, and it's easy to become proficient at creating custom colors.

If you want to erase part of a screen, or the whole screen—or have just drawn something you decide looks awful—you can resort to several different commands within the EDIT menu that make doing these changes easy. For instance, use the Frame command to mark off an area of your screen. You can then use the Erase command to fill that area with the background color (effectively "erasing" it), or the Cut, Copy and Paste commands to either cut it out and paste it elsewhere, or simply paste a copy of it in a different area of the screen, leaving the original intact.

My favorite menu option is SPECIALS. The commands within this menu let you magnify an area for fine editing, create kaleidoscopic effects, draw in custom rainbow paint, and create pseudo-animation.

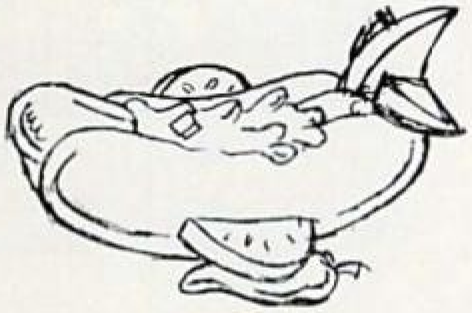
For example, if you choose the Cycle Draw command from SPECIALS, you first define a range of colors. Then, when you draw something in this mode, the trail left by the brush is a rainbow of the colors you selected. Once you've drawn something using Cycle Draw, choose Cycle Color—and the colors within the range you selected will begin to rotate at any speed you choose to create the illusion of motion. This lets you make animated pictures that will astound your friends and family. You don't have to tell them how easy it is.

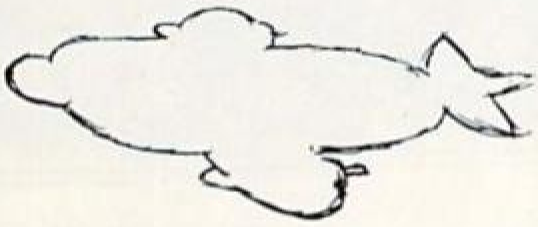
All in all, **Graphicraft** is a good program that inexpensively introduces you to painting and drawing on your Amiga. It may not answer the needs of some professional Amiga artists, but then not all of us are serious artists. But we can all use **Graphicraft** for serious fun.

How to HotDog Using *Graphicraft*

by Jack Haeger, Art Director,
Commodore-Amiga

Some of you may be wondering how I got this hotdog to fly. Others may be asking, "When's lunch?" The truth is that I got this idea about 11:30 one day—almost lunchtime. Since I'm from Chicago, that can mean only one thing. Hotdogs. Now, I've seen hotdogs depicted in every medium from neon to neoprene. But had I ever seen one fly? Nope, not a one. So I took out my sketchbook and rendered this missle of meat: *Jumbo Dog.*

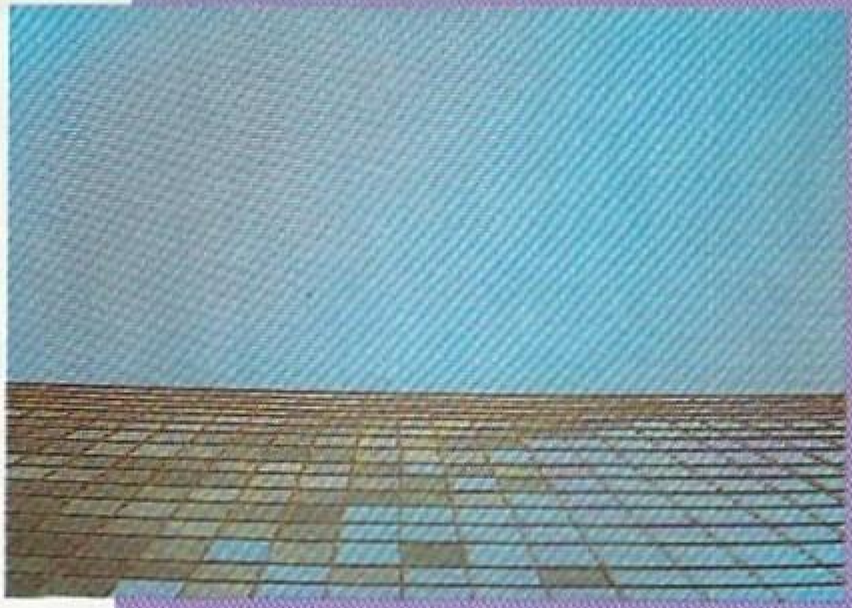




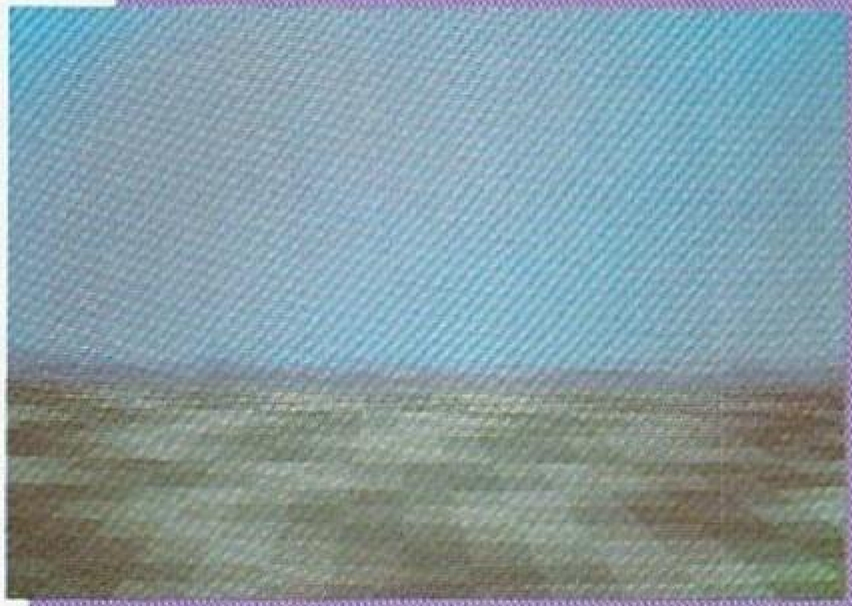
I thought an appropriate setting would be an Air Force test strip in the desert. That way the ground would be fairly flat, with no trees or buildings to conflict with the effect of a moving landscape I wanted to create using the Cycle Color option. (This effect, of course, is not reproduced here.)

To get the hotdog from my sketchbook to the screen, I redrew it, scaled it to fit the screen, and traced the drawing onto a sheet of transparent acetate. I taped the acetate to my screen, and outlined the hotdog using a single-pixel brush.

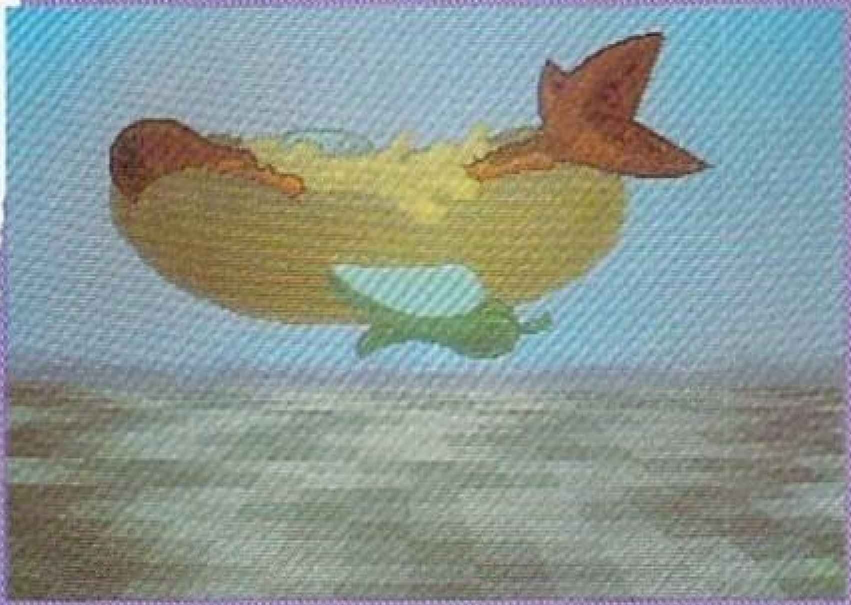
To make the hotdog look suspended in air, I added a drop shadow that is just a shade darker than the darkest color in the cycle-color range.



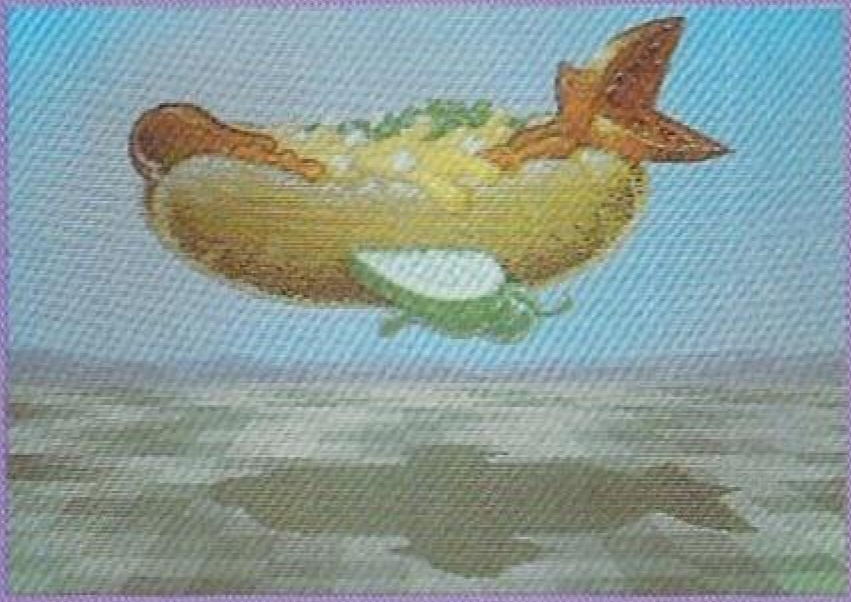
First, I drew a grid that would be a guide for my color-cycling landscape, and used several shades of tan all in the same row on my palette, so when I cycled them, the ground would appear to move.



Then, I added the mountains to the background, far in the distance, so they wouldn't interfere with the illusion of movement.

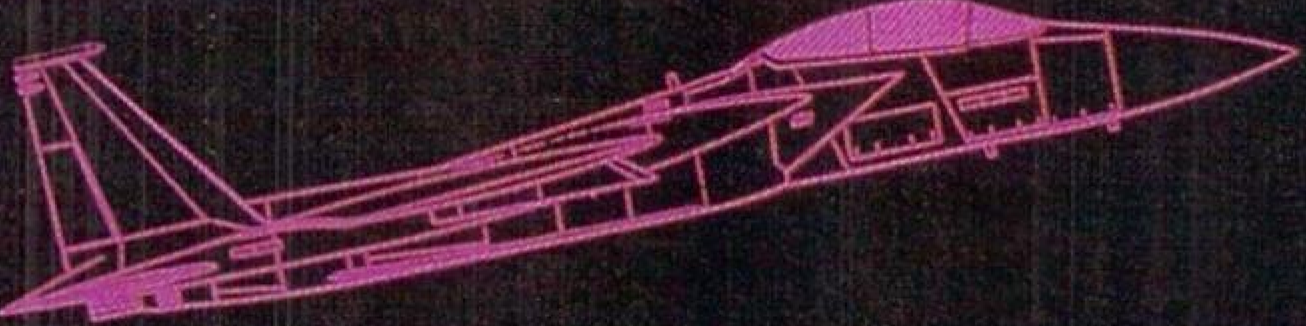


Next I traced the hotdog from my sketchbook onto the screen, and laid in the basic colors using the Fill option. Then I used a single-pixel brush to create shading and reflections.



After about an hour or so of tweaking and fine-tuning, the image was finished—just in time to get home for dinner.

BugBusters!



Playtest Pilots of the Computer Age

by Shay Addams

Before the Air Force commits a new jet fighter to mass production, daredevil test pilots subject it to intense shakedown flights, looking for design flaws that could prove fatal. Software companies, to ensure their programs don't crash while you're in the cockpit, recruit beta testers — playtest pilots — to search for deadly bugs lurking within the code of a new adventure, shoot-'em-up or strategy game. What most people don't know about these unsung heroes of game development is that playtesters also contribute creatively, making suggestions for changes and improvements that ultimately increase a program's "fun factor."

"It's a way to get in on the act," explains Stephen Kimmel, a 36 year-old chemical engineer from Tulsa, Oklahoma, who has been testing Infocom's all-text adventures for two years. "I don't pretend I have a *lot* of influence on the final version of a game, but I know they have to pay attention to at least some of my suggestions, so it is a creative act."

Kimmel, who also writes short stories for several science fiction magazines, recalls recommending a couple of changes in *Cutthroats*. One was to have something happen to the treasure-laden player after he returns from the submerged wreck to his own ship. The surprise they added was one of *my* favorite moments in the game.

"I also find lots of 'logical bugs'— not just programming errors, though they abound as well," Kimmel continues. It was such a bug that led to his enlistment in Infocom's corps of playtest pilots.

"After finishing *Infidel*, I wrote Infocom an incensed letter describing all the bugs I had run across, telling them I'd paid good money for this game and was really upset. The bug that incensed me most was a logical inconsistency. The game is set near the Nile River in Egypt, but you could walk *around* the Nile in a few steps."

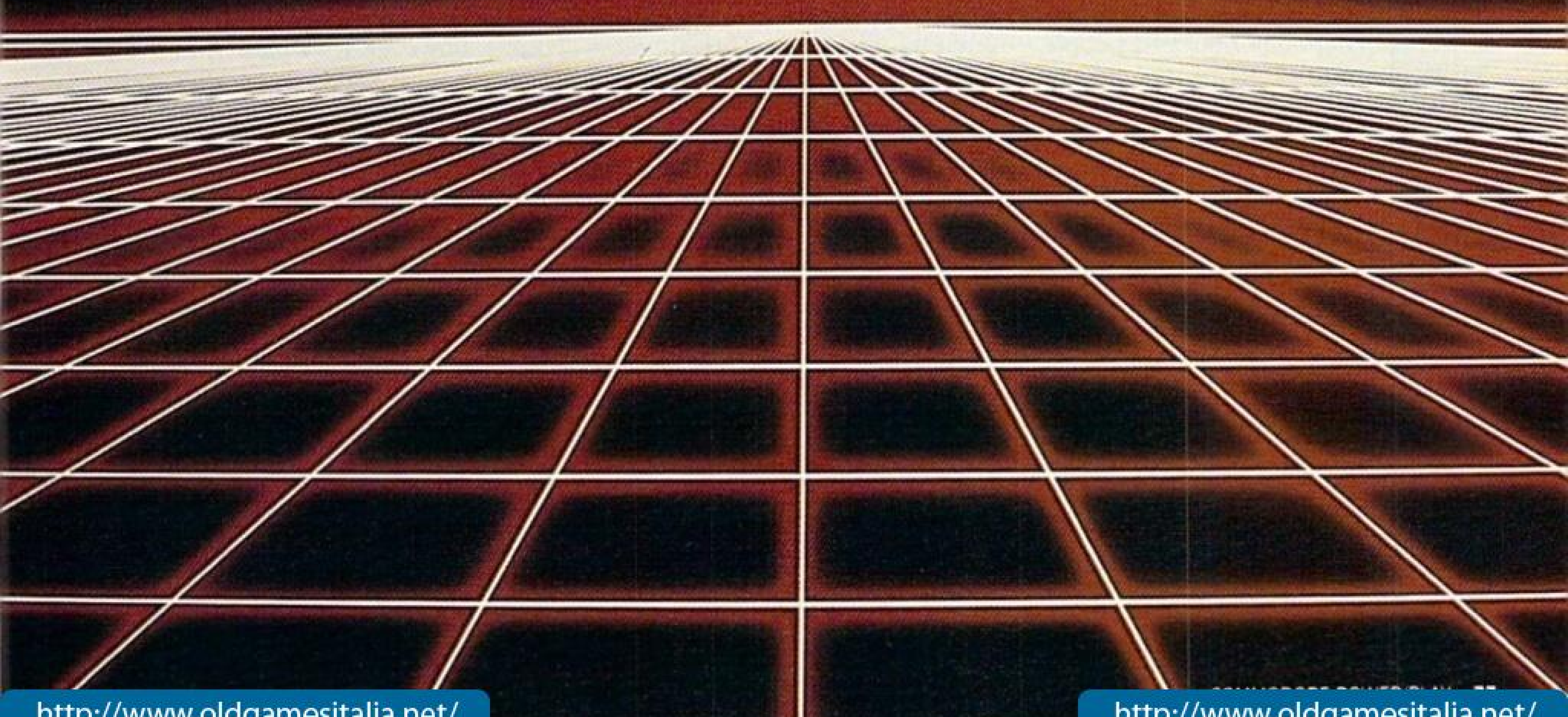
This infuriated Kimmel because it didn't make sense and was especially out of place in a game that consisted of logical puzzles.

"And near the end of the game, when you're deep inside the pyramid," he laughs at the memory, "you find a bottomless pit. I was dismayed to discover that if I dropped a feather or anything light into it, the text said I could hear it hit the bottom—in a bottomless pit! Michael Berlyn, *Infidel*'s author, wrote a nice letter thanking me for pointing out these and other bugs, and not long after that I ran into him at the Consumer Electronics Show in Chicago. I told him my letter would have probably been more useful if they'd received it before the game's release and asked about the possibility of beta-testing future Infocom games. My phone rang a week later, and Infocom asked me to playtest *Cutthroats*."

In addition to the game, Kimmel received photocopies of the documentation and paraphernalia, a nondisclosure agreement (in which he agrees not to tell anyone about the game until it is released) and three to four comment sheets. Since then he has playtested *Suspect*, *A Mind Forever Voyaging*, and *Spellbreaker*.

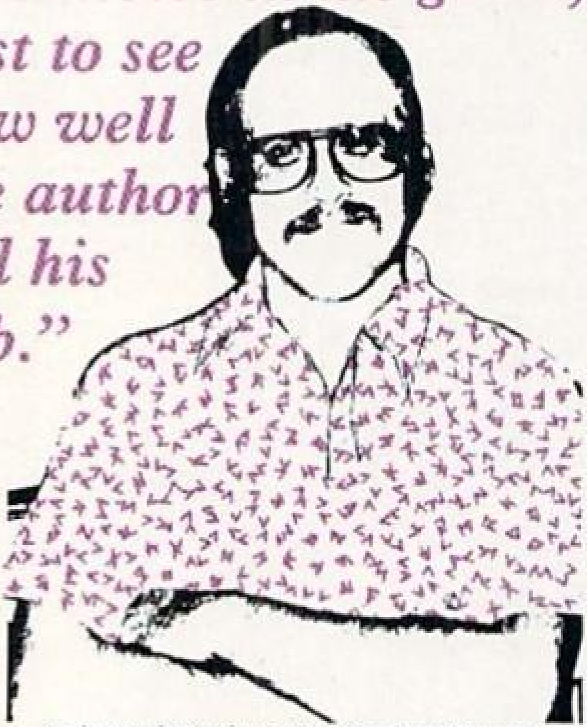
Differences Between Testing and Play-testing

"The biggest difference is that I try things I otherwise wouldn't do, silly things that I know wouldn't do me any good in solving the game: like finding out if I can shoot this gun with itself," Stephen Kimmel explains. "Sometimes I intentionally try to shoot holes in the game, just to see how well the author did his job. In *Spellbreaker*, I found one flaw in a place referred to as a 'slippery plane,' where there were no walls. Instead of saying 'walk east' or 'go east,' I wondered what would happen if I typed in 'slide east.' The program said something like: 'You can't slide the east wall' — after it had just said there *were* no walls. Another difference is that when playtesting, I have to make notes of *everything* that seems the least bit strange. If I were playing, I would simply laugh at something and say, 'Hey, look what happened, the programmer must have missed that.' And when I reach the state of 'mind-lock' and can't seem to make any progress with a puzzle, I can't just put the game away and do something else while my subconscious works on the problem. That's because Infocom gives me a three-week deadline, so I have to slog a lot harder to complete it in time.



"The worst part of playtesting is that moment of panic when I realize I've only got two days left and haven't finished yet...pushing myself harder and harder to break that state of mind-lock and get it over with. When I'm done, I completely ignore the comment sheets and type up an average of six single-spaced pages, numbering and detailing each problem. With *Spellbreaker*, which I didn't quite get to finish, I did 11 pages."

"Sometimes I intentionally try to shoot holes in the game, just to see how well the author did his job."



Independent playtester Stephen Kimmel

After he turns in his report, Infocom gives Kimmel his choice of any of their games. Besides the free games and a crack at finding logical problems with the situations devised by the ZorkMasters of Infocom, Kimmel says he also likes playtesting because, "I enjoy being one of the first people in the country to play a new adventure."

Alpha Testing: The In-house Bug Busters

Kimmel's work is made far less frustrating by Infocom's in-house staff of alpha testers, who initially test a new game on a massive DEC mainframe, then on Commodore and other micros before sending it to 15 to 25 beta testers.

"We shudder when people say *play*testing," comments Elizabeth Cyr-Jones, who heads up the department. "It's eight hours a day in front of a terminal. We know a program will be in testing for five months, so it's not playing. On the bug sheets, you must note what you were doing when the program crashed, anything odd the game does, any problems, suggestions you might have. If a problem is too easy, testers will tell the author. They may even suggest problems or different ways of saying something — so there's a lot of interaction between the author and testers."

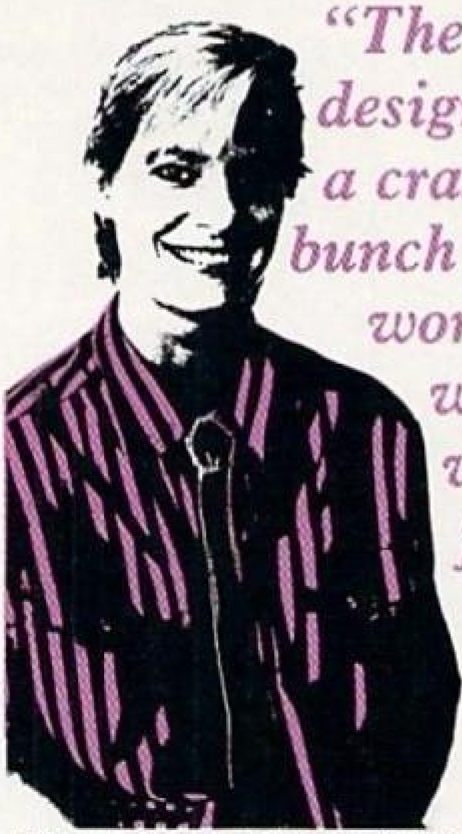
Suzanne Frank, one of Infocom's alpha testers, elaborates: "In alpha, the games are fraught with so many bugs that it's hard to find your way through. And usually you can't even solve the game, because you run into a bug that crashes the program or blocks progress some other way."

One programming bug alphas found in *Suspect* caused the early Commodore, Atari and Apple versions to crash if the "go to" command was used outside the house.

"At the beginning," Suzanne recalls, "when *Suspect* wasn't written very well, I thought I'd nearly solved it and just needed one more piece of evidence. I decided it must be in the trunk of the car — but when I opened it and looked in, there was no text! Dave Lebling had written the paragraph that describes the contents of the trunk, but overlooked implementing the code that displays it when you look there. I told him and he fixed it. Then when I read the text, it described the trust folder, but wouldn't let me take it! So he had to fix *that*.

"The designers are a crazy bunch of people to work with, very funny. We all sit down together and they listen to our comments and suggestions. So we're not just playing — we're engaging in true interaction with the implementers. In *Suspect*, for example, the bartender glances at his tip glass, which implied to me that he wanted a tip. But when I said 'Tip bartender,' nothing happened. So I asked Dave about it and he implemented a response to that command. It's rewarding to go back into a game two days later and see your suggestion as part of the game. Testers often write the clue books, too. Three of us, along with Brian Moriarty, did the one for *Wishbringer*."

"The designers are a crazy bunch to work with — very funny."



Infocom's in-house playtester Suzanne Frank

Like Stephen Kimmel, Suzanne has a "systematic method of testing, trying everything possible in every imaginable place. Give me a gold coin and I'll put it in every slot I can find; give me a lever and I'll pull it — even if I'm not supposed to." She confesses that, "After gametesting for over a year, some of the excitement is gone, and I'm usually pretty bored with a game near the end. That's not true of all testers. Some people get really excited, jump up and yell 'Yeowww!' when they find a bug. Until I solve a game, however, it's a blast. And there are still those times when, after eight to ten hours at the terminal, I suddenly look up and realize I didn't eat dinner yet."

"We know a program will be in testing for five months, so it's not playing."

Elizabeth Cyr-Jones, head of Infocom's in-house bug busters

The entire testing process can span three to five months, sometimes longer if problems show up in gamma. That's the ultimate stage, reserved for the elite corps of Infocom's bug-busting army (a few people, like Kimmel, do beta *and* gamma). Like the 150+ out-of-house Infocom testers, gammas are people who wrote in and volunteered for this arduous task. Suzanne says there are 30 to 40 who are excellent and test nearly every game.

Testing Other Types of Games

Infocom's testing process is representative of the software industry, but the method often varies for different types of games or to suit the style of a particular programmer. For instance, Lord British, creator of the *Ultima* series from Origin Systems, writes his programs in individual modules that are "very clean to begin with" according to Origin's Dave Albert.

"Lord British writes 'very clean' games that are easy to test."

Dave Albert, head of the Origin Systems' playtesting

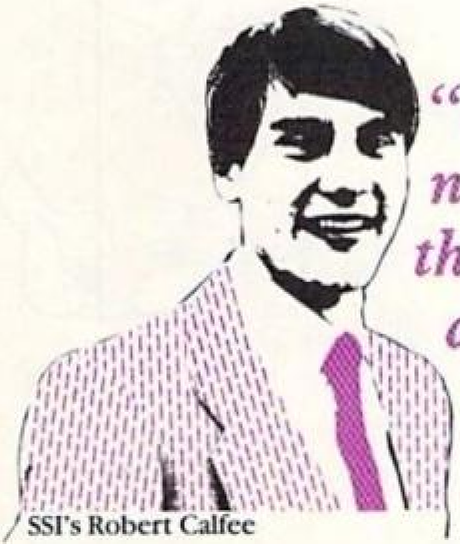
"We normally do alpha and beta testing," Albert explains, "but with *Ultima IV* the modules were put together near the end, and we brought in the staff of 'The Wizard''s Journal,' a newsletter devoted to *Ultima*-type games, to test it."

The creators of the board game that inspired Origin's *AutoDuel* tested that game, for obvious reasons. Albert, who's in charge of Origin's testing, usually calls on "people I've met and have gotten to know since I started doing this." (Albert co-authored *Xyphus* and has worked behind-the-screens on dozens of well-known games.)

"Besides looking for bugs, Origin testers check to see if the clues are adequate, if there is anything awkward or jarring that breaks up the fantasy," Albert says. "The reason is that, in a role-playing game, our goal is to make the computer transparent. We ask testers to stay on guard for the ability to paint yourself into a corner in a game. And we check for play balance, to make sure it's not too hard, not too easy.

"In *Moebius*, for example, the combat system is a simulation of martial arts-style fighting between two animated figures. Testers noticed that the game required you to hit the enemy in too small a target in order to score a critical hit, so we made it a little easier by expanding the size of the area where you could land a death blow. We spend four to six weeks on each game, seeing if we can speed this up a touch, slow this down a bit. We've been tweaking *Moebius* on how fast your sword is dulled when you cut things with it. All this, just to get it to *feel* right. There are no rules; it's a very intuitive process."

The rules are rigid at Spinnaker, however, where all testing is done in-house. Susan Hunnewell, responsible for Quality Control of Spinnaker's educational and adventure titles, says, "Testers are assigned specific portions of a game to go over — certain locations in an adventure or even tracks on the disk. A printer is attached to each one's computer, and at the end of the day an editorial assistant collates the printed material for assessment."



"Sometimes its necessary to make the computer cheat at the higher skill levels."

SSI's Robert Calfee

Spinnaker's testing is done on IBM PC's by two full-time and up to four part-time people, and might consume from 200 to 250 hours, depending on the game. Then the conversions are individually tested, especially for the graphics and sound effects, which can vary immensely between an Apple and a Commodore version.

We ask customers to try out new games so we can get a real consumer's reaction.

Susan Hunnewell of Spinnaker

"Betas don't really do 'bug-busting' for us," says Hunnewell. "Instead, we ask customers to try out new games so we can get a real consumer's reaction. Their feedback often includes bugs, but we're more interested in their opinion of the program, or to determine if there's a market for an unsolicited program."

She recruits from people who have filled in warranty cards or offered their services. With the former, she phones the families and "explain my need and try to give them an opportunity for input into the game's design. Parents and teenagers are terrific at this."

Even the president of Strategic Simulations, Joel Billings, occasionally does a bit of playtesting in his free time, and so do the game designers.

Continued on pg. 80

Most of the strategy/war games SSI produces, however, are run through the grinder by one part-time and two full-time in-house people.

Robert W. Calfee, in charge of SSI's Technical Support, says he has a long list of volunteers from which he selects four to ten to try a new game. "In addition to having testers find elementary bugs — the ability to win a game simply by pressing a function key is a good example — we ask them to see if the game presents a real challenge. Our programs usually have one to five different difficulty settings, if the toughest one is a cakewalk, something is wrong.

"And with a war game, you're not only watching for anything that might go wrong with the graphics, the military units, and so on, but you're also looking for play balance. In a war game, play balance has to do with the computer intelligence. If the computer isn't thinking right, and makes dumb moves, then it isn't any fun. And sometimes, it's even necessary to make the computer intelligence cheat at the higher skill levels. If the computer is losing heavily in *Computer Quarterback*, it peeks at the play you've just chosen and then picks the best response. The reason we do that is so that even the veteran players (and novices, once they've mastered the easier levels) will still face a challenge from the computer.

"Testers suggest changes and improvements all the time," Calfee continues. "Everyone has a better way of doing it. In *Gemstone Warrior*, someone complained that the player, when protected by his invisible shield, could not fire out through it. That was a good point, so we made it possible."

Unlike companies that send out numerous beta copies, then incorporate the research into a final version that is gamma tested, SSI and a few other software houses will fix bugs and implement suggested revisions, then send the game back to the same people for more testing.

"With us, there's no solid delineation between playtesting steps. It's either in testing or it's released," Calfee says.

The process can last from as little as a week to as much as a month. By the time it's over, the tester has a finalized version of the game, minus the glossy packaging and documentation. (SSI is noted for complex and lengthy manuals, so testers also check the author's rough draft of the documentation for clarity and scope.)

"The emphasis [in playtesting] is on the testing," Calfee stresses. "If testers find enough bugs, make valuable suggestions, they'll be kept on the list. And the best ones are put on the priority list."

SSI doesn't pay its testers, and neither do other software houses. Unlike Air Force test pilots who receive hazardous duty pay for each mission, the playtesters do it for the experience, the thrills, the unique challenge. So the next time you take off in a flight simulator, dip your wings in salute to those hardplaying, hardworking playtest pilots of the Software Air Force — whose all-night "bug-hunts" and creative contributions helped make the game so much fun.

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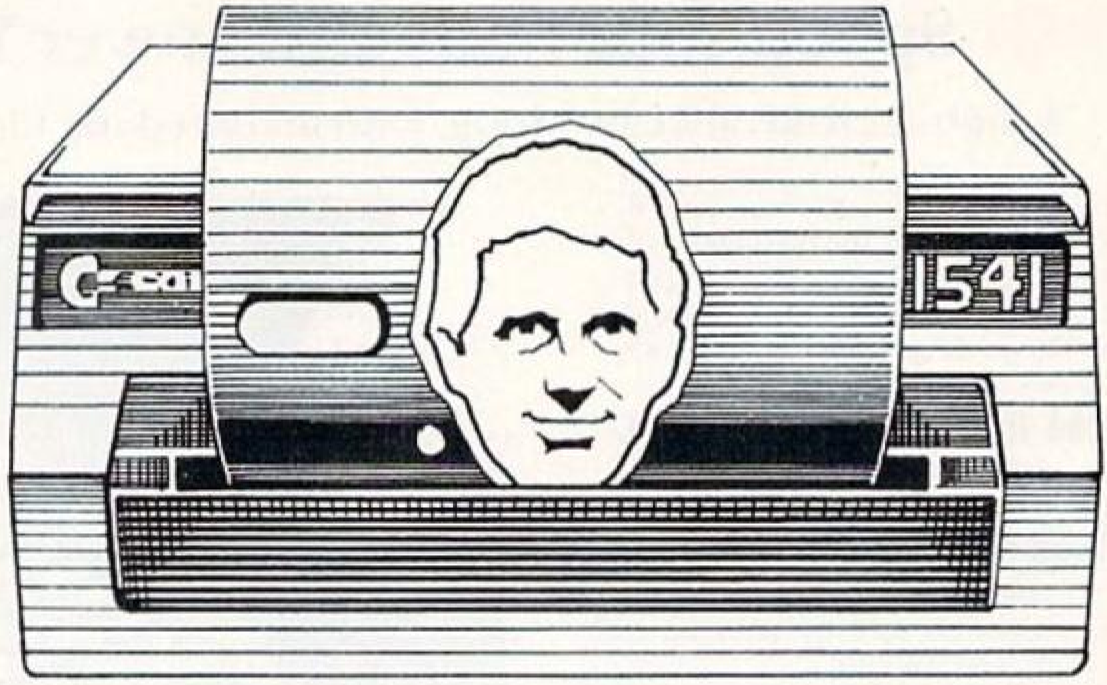
COMPUTER WIZARD

BY LOUIS F. SANDER

Disk Drives Demystified

Part 1



If you're a Commodore computer user, you either own a disk drive already or you have one at the top of your wish list. This month's column is a compendium of elementary information on using Commodore drives. It will be especially valuable to beginners, since much of this information is not readily available elsewhere. For the same reason, even more advanced users may find value in these pages. In the next issue, we'll expand on what's presented here.

The drives we will consider are the 1540, 1541 and 1571. Commodore has made other drives, but these three are the most important ones by far. The 1540 was the original ivory-colored drive for the VIC 20. When the Commodore 64 was introduced, the 1540 was replaced by the more compatible 1541. The 1571 was designed for the Commodore 128. With a few minor exceptions, any of these drives will work with any computer having a Commodore serial bus. VIC 20's and very old drives are involved in most of the exceptions.

Buying Diskettes

The 1540 and 1541 are single-sided drives. That means they have one read/write head, positioned below the diskette. The 1571, on the other hand, is a double-sided drive, with two read/write heads—one on the bottom and one on the top. The two kinds of drives work best with two kinds of diskettes: If you have a 1571, it's best to buy double-sided, double-density diskettes. If you have a 1541 or 1540, you should buy the less expensive single-sided, double-density variety.

The "-sided" specification for diskettes refers only to the manufacturer's testing process. Single-sided diskettes are tested only on the bottom, while double-sided ones are tested on the top, as well. Single-sided disks will often work in double-sided drives, but there's no guarantee from their maker. Double-sided disks will always work in single-sided drives, but their extra cost is wasted there.

The "density" specification refers to the quality of the disk's recording surface. All the Commodore drives, and most others in use today, are designed for use with double-density diskettes. Single density diskettes were popular several years ago, when disk drive recording density was much less than it is today. They will work in a pinch in your Commodore, but in general you should avoid them.

Diskettes also have a "soft-sectored" or "hard-sectored" specification. Commodore drives work equally well with either type.

If you have a single-sided drive, it's possible to use the "flip side" of a diskette, *if* you'll do some cutting and take some risks. To make a "flippy" disk, you cut an additional write-enable notch, immediately opposite the one that's already there. (When you hold your disk with its oval opening down, so the existing notch is toward the top of its right edge, the location for the new notch is toward the top of its left edge.) You can use another disk as a template for cutting the notch, which must be positioned quite precisely. Mark the position, then use scissors or a razor blade to cut a new notch. Once the notch has been cut, just flip the diskette over and treat the second side as a brand-new disk.

The much-discussed risks of using flippies are real, but manageable. First of all, since the manufacturer hasn't tested the second surface, it may have dead spots or other flaws. Second, since flipping the disk makes it rotate in a reverse direction with respect to its jacket, the jacket's cleaning mechanisms are bypassed. Either problem can cause a disk or a program to self-destruct, and can make its owner want to do the same. Fortunately, the worst rarely happens, but it *does* happen. So if you use flippy disks at all, avoid using them for valuable programs or data. Many people use them exclusively for backups, while many others don't use them at all.

The Basics of Using Your Drive

The most frequent use of disk drives is to save and load programs. They have similar storage functions for data files such as word processing documents, mailing lists and the like. A very complete set of commands exists for performing these functions, as well as for doing other useful tasks. Beginners can find them difficult at first, but with a bit of use, they become simple and self-evident. We'll mention the more common ones here.

The commands used for Commodore drives are the same, regardless of the computer through which they're issued. (Some computers, like the Commodore 128 and Plus/4, have two sets of commands: the universal set covered here, plus an improved, simplified set. Many commercial programs also implement simplified disk commands.)

Before a disk can be used in your drive, you must use your computer to format it. (Sometimes the words “header” or “new” are used instead of “format.” They all refer to the same thing.) Formatting sets up the blank disk to receive information from your computer, and every disk must be formatted before it can be used to store programs or data. Each computer manufacturer uses its own formatting system, so one computer can hardly ever read disks that were formatted on another brand, unless the two brands are “cloned.” (CP/M disks for the Commodore 128 are one of the very rare exceptions.) You can take a disk from another computer and reformat it on your own system, but that, of course, erases any data it previously held.

Here's the universal format command for the drives we're covering here:

```
OPEN 15,8,15
PRINT#15,“NEW0:diskname,id”
CLOSE 15
```

In this command, *diskname* is a name you want to assign to the disk, and *id* is an identification code. The *diskname* may be up to 16 characters long and can include any character except the comma, question mark or asterisk. Most people use only unshifted letters and numbers in their disknames, since other characters can list strangely in directories.

The *id* must be two characters long. Almost any character is legal, but you're asking for trouble if you use anything but numbers and unshifted letters. You should avoid assigning the same *id* to several disks, because doing so can cause trouble with certain programs. Most people use a sequence like AA, AB, AC, AD, etc., maintaining a checklist to avoid duplication.

Our formatting example, and all those to come, assume that your disk drive has device number 8, which is the near-universal device number for the first drive on any system. In the unlikely event that your drive has a different number, use that number instead of the 8 in our examples.

Once a disk has been formatted, you can save BASIC programs to it by using

```
SAVE“programname”,8
```

This month's column is a compendium of elementary information on using Commodore disk drives that will be of special value to beginners.

The *programname* has the same character restrictions mentioned above for *diskname*. You can load a BASIC program from disk by using

```
LOAD“programname”,8
```

You can load a machine-language program with

```
LOAD“programname”,8,1
```

When a program's instructions require it to be loaded in this way, it's a good indication that the program was written in machine language.

If you want to see a list of the programs on your disk, plus the *diskname* and *id*, you can look at the disk directory. The universal method of doing this is to

```
LOAD“$”,8
LIST
```

This loads the directory as though it were a BASIC program. Be careful, since it also overwrites any BASIC program you have in memory at the time.

Once your directory has been loaded, you can list it to your printer by using these commands:

```
OPEN4,4:CMD4
LIST
PRINT#4:CLOSE4
```

When you look at a directory listing, you'll see the diskname, in reverse field, on the top line, followed by the disk id. Also on that line are a 0 and a 2A, which are characteristic identifiers for the disk drives we're talking about here.

Following the diskname is a listing of all the programs and data on the disk. (In our discussion, we'll call each of these a file.) Each line has a number, a filename in quotation marks, and a three-letter code at the end. The number gives the size of the file in blocks, with each block equaling about 250 characters. The filename, of course, is the name that was entered when the file was saved. The three-letter code tells whether the file is a program (PRG) or a data file (SEQ,REL,USR). The differences between the types of data files are beyond our scope at the moment, but they are covered in depth in your manual.

At the bottom of the directory listing is a line showing how many disk blocks are free for storage of other files. A 1540/1541 diskette can hold 664 blocks in total, while a 1571 can hold 1,328.

There's also a limitation on the number of files a disk can hold. It's 144 for all the drives under consideration here. If you try to save something that exceeds the block or file limits on your disk, the drive will refuse to save it.

Learning More About It

We've mentioned only the most rudimentary disk commands here, in an effort to enlighten beginners. There are many additional commands available, and there are many ways to use them all. The key to understanding these matters is the universal key to unlocking computer knowledge: Read the manual!

You don't have to understand every word in the manual, but you should be generally familiar with the table of contents, the overall organization of the book, and the material that applies to the operations you do most frequently. Don't be surprised if some of the chapters are unintelligible—some technical material isn't comprehensible to ANY beginner. As you explore the manual, you'll notice that your understanding increases with every reading. This is a common phenomenon with computer literature, and you can take advantage of it by reading everything several times.

There are also some good books on Commodore drives and reading them supplements your efforts with the manual. To find them, read the ads in this magazine or visit a well stocked bookstore.

Additions and Accessories

There are dozens of programs, many in the public domain, to make it easier to work with your Commodore drive. The most famous of these is the Commodore 64's DOS 5.1, generally

Continued on pg. 84

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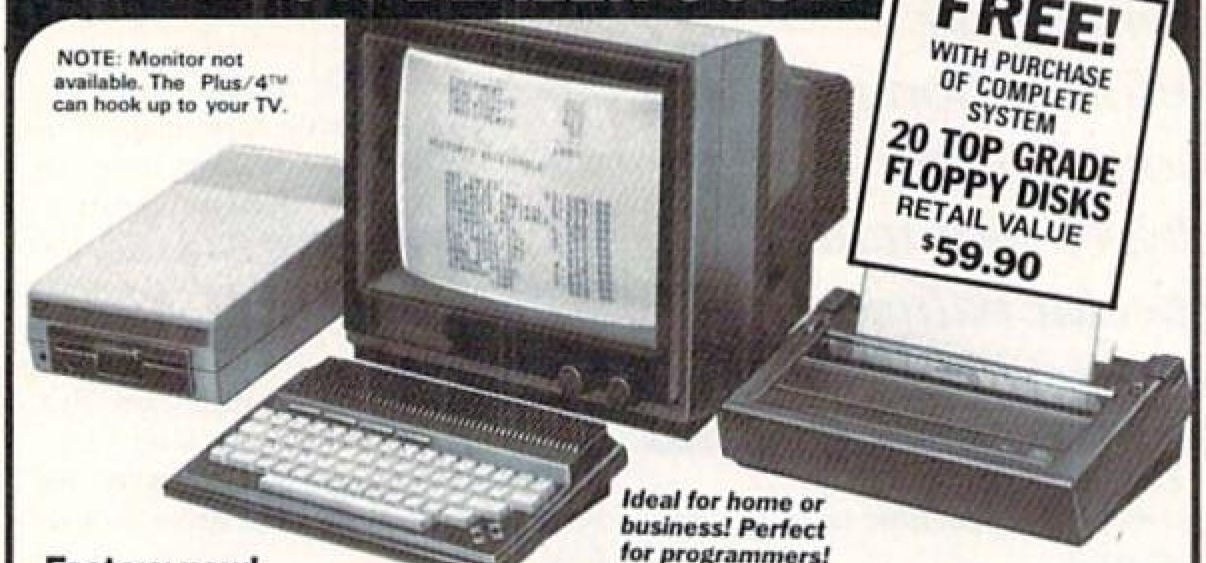

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known as the wedge. It's a machine-language program provided on your test/demo disk, and it greatly simplifies the Commodore disk commands. With the wedge, most commands can be entered with from one to three keystrokes. With the wedge, a directory doesn't overwrite anything already in memory. And, with the wedge, it's easy to use all the Commodore disk commands. If you have a 64 and a disk drive, you *must* learn to use the wedge. Since it isn't very well documented, it's best to learn it from a friend. The commands are easy, and once you get the hang of the program, you'll wonder how you lived without it.

If you have a Commodore 128 or a Plus/4, you don't need a wedge, because many simple and powerful disk commands are built into your version of BASIC. These are covered in the *computer* instruction manual, rather than the one for the drive. Read it.

In addition to the wedge or the commands built into the newer BASICs, there are two valuable programs that almost everyone can use: a copy program and a fast-load program.

The copy program is NOT for software pirates! It's just a program to make a backup of an unprotected disk. Many such programs exist in the public domain and elsewhere. If you're a user group member, you can no doubt get several versions from the club library. If you subscribe to an on-line service, you can certainly download one.

There are two basic types of copy programs. The first one copies file by file, and will work for most disks you encounter. The second copies sector by sector, and is needed when copying disks holding random files or other customized material.

The fast-load program can double your pleasure by doubling (or more) the speed with which your programs load. Such programs are available in cartridge form or on disk, and they are worth their weight in gold. There are commercial versions, public domain versions, and versions published in magazines. Some versions include a copy program as well. Unfortunately, not all fast loaders are compatible with all software, so be sure to read any fast-loader reviews you can find prior to making your purchase. ■

BY D. W. SAMPSON

Assignment Sheet

for the Commodore 64 with 1526 or MPS-802 Printer

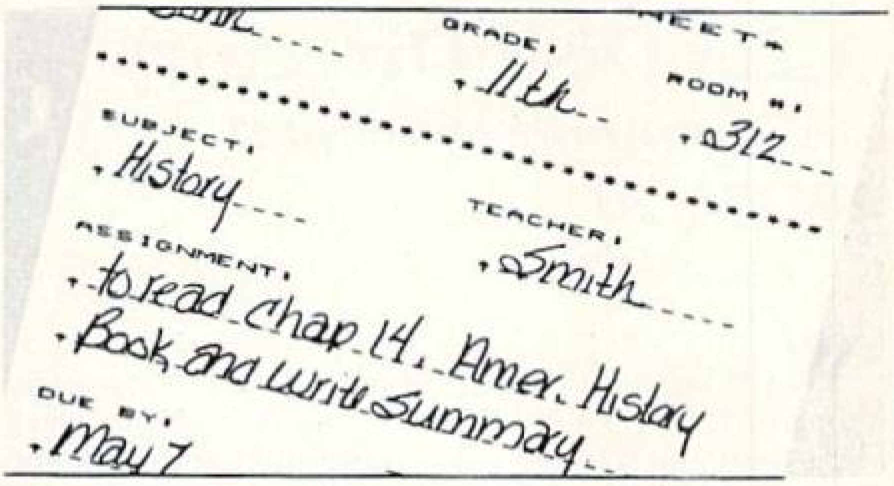
As the father of three teen-aged students, I frequently hear the question, "Dad, can I call so-and-so to find out what our homework is for tomorrow?" When I ask, "Why didn't you write it down?" they usually reply, "I did, but I lost it."

In response to this problem, I created an Assignment Sheet form. They can print out as many copies as they want at a time, and put them in their three-ring binders. Each time they receive an assignment, they fill out one of the forms, which asks for the following information:

- Name, grade and room number
- Subject and teacher
- The assignment
- Due date and date turned in
- References used to complete the assignment
- Grade received
- Memo

Now a complete record of each assignment they receive is safely stashed in their binders—provided they remember to fill out the forms.

The program for creating your own Assignment Sheet forms is at the end of this article. If you are using any printer other than the Commodore 1526 or MPS-802, you may need to change the secondary address and CHR$ (refer to your printer's manual for information on how to do this.)



GRADE: 11th

ROOM #: 312

SUBJECT: History

TEACHER: Smith

ASSIGNMENT: to read Chap 14. Amer. History Book and write summary

DUE BY: May 7

Before typing this program, read "How to Enter Programs" and "How to Use the Magazine Entry Program." The BASIC programs in this magazine are available on disk from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007, 1-800-831-2694.

Assignment Sheet

```
5 PRINT"[CLEAR,RVS,WHITE,RVOFF]"
  :POKE 53280,7:POKE 53281,9'DQTJ
10 PRINT"[DOWN2,RIGHT10]*ASSIGNMENT
   SHEET*"'BALD
15 PRINT"[DOWN2,RIGHT4]*PLEASE TURN ON
   PRINTER!!*"'BADJ
20 PRINT"[RIGHT,DOWN]*PROGRAM WILL PRINT
   MULTIPLE COPIES*"'BAXI
21 PRINT"[DOWN2,RIGHT4]*PROGRAM WILL RUN
   UNTIL STOPPED*"'BAPJ
30 PRINT"[DOWN2,RIGHT4]*PRESS AND HOLD
   (RUN/STOP) TO STOP*"'BAHJ
35 PRINT"[DOWN2,RIGHT4]*PRESS (P) TO START
   PROGRAM*":INPUT N$'CDTN
40 IF N$<>"P"GOTO 30'EEHD
50 IF N$="P"GOTO 60'DEND
60 A$=CHR$(14)'CGWE
70 B$=CHR$(129)'CHDF
80 OPEN 4,4,0'BFRF
90 PRINT#4,CHR$(147)'CHVH
95 PRINT#4,CHR$(13)'CGPM
100 PRINT#4,A$;A$;SPC(5)"*ASSIGNMENT
    SHEET*"'CKAD
110 PRINT#4,CHR$(13)'CGPX
111 PRINT#4,A$SPC(3)"NAME:"SPC(10)"GRADE
    :"SPC(5)"ROOM #:"'ELKG
112 PRINT#4,CHR$(13)'CGPA
120 PRINT#4,A$SPC(3)"[^]----------"SPC(5)"
    [^]-------"SPC(3)"[^]-------"'EKJG
130 PRINT#4,CHR$(13)'CGPA
140 PRINT#4,A$SPC(2)"********************
    *****************"'CGFH
160 PRINT#4,CHR$(13)'CGPD
170 PRINT#4,A$SPC(3)"SUBJECT
    :"SPC(10)"TEACHER:"'DJFK
180 PRINT#4,CHR$(13)'CGPF
190 PRINT#4,A$SPC(3)"[^]----------"SPC(8)"
    [^]------------"'DIYM
200 PRINT#4,CHR$(13)'CGPX
210 PRINT#4,A$SPC(3)"ASSIGNMENT:"'CGGC
220 PRINT#4,CHR$(13)'CGPA
230 PRINT#4,A$SPC(3)"[^]-----------------
    ------------"'CGIH
240 PRINT#4,CHR$(13)'CGPC
250 PRINT#4,A$SPC(3)"[^]-----------------
    ------------"'CGIJ
260 PRINT#4,CHR$(13)'CGPE
270 PRINT#4,A$SPC(3)"DUE BY
    :"SPC(10)"TURNED IN ON:"'DJRL
280 PRINT#4,CHR$(13)'CGPG
290 PRINT#4,A$SPC(3)"[^]------"SPC(10)"[^]
    ---------"'DJEL
300 PRINT#4,CHR$(13)'CGPY
310 PRINT#4,A$SPC(3)"REF.USED TO COMPLETE
    ASSIGNMENT:"'CGUJ
320 PRINT#4,CHR$(13)'CGPB
330 PRINT#4,A$SPC(3)"[^]-----------------
    ------------"'CGII
340 PRINT#4,CHR$(13)'CGPD
350 PRINT#4,A$SPC(3)"[^]-----------------
    ------------"'CGIK
360 PRINT#4,CHR$(13)'CGPF
370 PRINT#4,A$SPC(3)"GRADE RECEIVED ON
    ASSIGNMENT:"'CGHO
380 PRINT#4,CHR$(13)'CGPH
390 PRINT#4,A$SPC(3)"[^]----------"'CGMK
400 PRINT#4,CHR$(13)'CGPA
410 PRINT#4,A$;A$SPC(10)"**MEMO**"'CKLE
420 PRINT#4,CHR$(13)'CGPC
430 PRINT#4,A$SPC(3)"[^]-----------------
    ------------"'CGIJ
440 PRINT#4,CHR$(13)'CGPE
450 PRINT#4,A$SPC(3)"[^]-----------------
    ------------"'CGIL
460 PRINT#4,CHR$(13)'CGPG
470 CLOSE 4:GOTO 60'CECG
```

END

BY DANIEL R. WINSTEAD

1,2,3 Disk Directory

for Commodore 64 and 8K VIC 20

While making a printout of my disk directories using the usual OPEN4,4:CMD4:LIST in direct mode, I realized just how much paper I was wasting on an 80-column page. Only about one-third of the page was being used. I then decided to write a program that would read up to three disk directories into memory, and then print them in three columns on an 80-column page.

Here is a brief description of how the program works:

Line 5	sets up a string matrix of three directories, each 100 lines long.
Line 7	clears the screen and homes the cursor.
Line 10	clears all of the elements in the matrix.
Line 20	asks the user how many disk directories are to be printed across a page.
Line 30	sets up a loop to read the desired number of directories.
Line 70	opens a channel on device 8 to read the directory.
Line 80	reads in the load address (not used here).
Line 90	checks for end of directory.
Lines 100-125	read in the directory items line by line and remove all quotation marks and some spaces to make enough room to fit three columns across a page.
Line 130	closes the channel and puts an end marker at the end of the directory array currently being processed. The loop is then repeated as many times as requested.
Line 200	opens a printer channel and clears some flags that determine if a directory being printed has any more entries.

Three directories are printed in their appropriate columns until all directory entries contain the end-of-directory marker(xxx). This is checked in line 320. The file is then closed and the program ends.

To use this program, load the program into the computer and then type RUN <RETURN>. You will be prompted to enter the number of disks from which you want directories printed out. Then you will be requested to insert the first disk into the drive and press any key to continue. The directory will be read into memory. You will then be requested to insert the next disk, if applicable. After the last directory is read in, the printout will begin. Make sure, prior to running the program, that the printer is set up properly. Run the program as many times as needed for more printouts.

If your directories are very short, you can get up to 15 directories listed on a single 80-column page. If one or more of your directories contains more than 100 entries, you can change the DIM statement in line 5 to accommodate more entries, if you wish. C

Before typing this program, read "How to Enter Programs" and "How to Use the Magazine Entry Program." The BASIC programs in this magazine are available on disk from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007, 1-800-831-2694.

1,2,3 Disk Directory

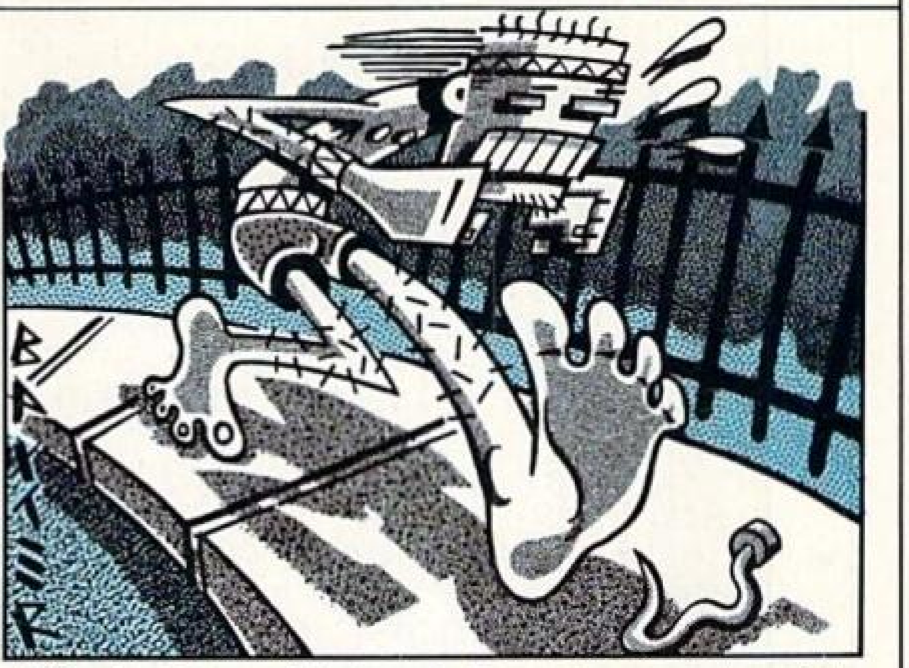
```
5 DIM C$(2,99)'BIOF
7 PRINT CHR$(147)'CFBH
10 FOR I=0 TO 2:FOR J=0 TO 99
   :C$(I,J)="":NEXT J,I'IURG
20 PRINT"HOW MANY DISKS(1-3):":INPUT N
   :PRINT'DDKF
25 IF N<1 OR N>3 THEN 20'FGRH
30 FOR I=0 TO N-1:L=0:PRINT'GIFE
40 PRINT"INSERT DISK#";I+1'CDTF
50 PRINT"HIT ANY KEY WHEN READY!"'BASH
60 GET Z$:IF Z$=""THEN 60'EHHG
70 OPEN 1,8,0,"$0":N$=CHR$(0)'DMIH
80 GET#1,A$,A$'BIXG
85 GET#1,A$,A$'BIXL
90 IF A$=""THEN 130'DFUH
100 GET#1,A$,B$:X=ASC(A$+N$)+ASC
    (B$+N$)*256:C$(I,L)=STR$(X)'KLGJ
110 GET#1,A$:IF A$=CHR$(34)THEN
    110'FPAC
120 IF A$=""THEN C$(I,L)=MID$(C$(I,L),
    1,26):L=L+1:GOTO 85'IFKI
125 C$(I,L)=C$(I,L)+A$:GOTO 110'DUII
130 CLOSE 1:C$(I,L)="XXX":NEXT I'DLTD
200 OPEN 5,4:A1=0:A2=0:A3=0:L=0'FSWD
201 IF N=1 THEN PRINT#5,C$(0,L):L=L+1
    :GOTO 210'HTMF
202 IF N=2 THEN PRINT#5,C$(0,L);
    CHR$(146)SPC(2)C$(1,L):L=L+1
    :GOTO 210'JJSK
205 PRINT#5,C$(0,L);CHR$(146)SPC(2)C$
    (1,L);CHR$(146)SPC(2)C$(2,L)
    :L=L+1'HSNO
210 IF A1=1 OR C$(0,L)="XXX"THEN A1=1
    :PRINT#5,TAB(26);:GOTO 250'JYOI
240 PRINT#5,C$(0,L);'BKWC
250 IF N=1 THEN IF A1=1 THEN PRINT#5
    :CLOSE 5:END'JJCI
255 IF N=1 THEN L=L+1:PRINT#5
    :GOTO 210'HLDM
260 IF A2=1 OR C$(1,L)="XXX"THEN A2=1
    :PRINT#5,TAB(26);:GOTO 280'JYUN
270 IF A1=1 THEN PRINT#5,C$(1,L);
    :GOTO 280'FRUJ
275 PRINT#5,TAB(26-LEN(C$(0,L)));C$(1,
    L);'EXJP
280 IF N=2 THEN IF A1=1 AND A2=1 THEN
    PRINT#5:CLOSE 5:END'LMIN
290 IF N=2 THEN L=L+1:PRINT#5
    :GOTO 210'HLEL
300 IF A3=1 OR C$(2,L)="XXX"THEN A3=1
    :PRINT#5:GOTO 320'ITOH
310 IF A2=1 THEN PRINT#5,C$(2,L)
    :GOTO 320'FQIE
315 PRINT#5,TAB(26-LEN(C$(1,L)));C$(2,
    L)'EWIJ
320 IF A1=1 AND A2=1 AND A3=1 THEN
    PRINT#5:CLOSE 5:END'KNOI
330 L=L+1:GOTO 210'DHWD
```

END

BY STEVEN PROPER

Joggers

for the Commodore 64



Welcome to the wacky world of barefoot jogging. Your mission is to win the annual Joe Jogging contest by surviving an onslaught of dangerous objects. What can possibly be dangerous about jogging barefoot? Well, besides the obvious stress on your knees and ankles, you should also be on the lookout for nails, toadstools, purple pollution, glass, pot holes, green worms, and poison apples. You may take up to eight faulty steps before you are disqualified, and have to start over. Each faulty step results in a change of the status color of your feet.

Get Ready, Get Set...

To ensure your success when typing in Joggers, please use the proofreader program that appears elsewhere in this magazine. Always save your programs before test-running them. Immediately after starting Joggers, you will see an opening screen with some abbreviated instructions. While this information is being displayed on the screen, the machine language and sprite data is being loaded into memory. Next, the screen will turn black for a few seconds as the custom-character data is loaded.

GO!

Assuming everything has been entered correctly, you are now ready to play. Joggers does not require a joystick. Instead, hold the F key to go left or hold the J key to go right. If you find it is too late to avoid an object, you may attempt to jump it by pressing the K key. Using the jump option will also increase your vertical status difficulty. Be careful, though. If you jump too far off the screen, the game will be disqualified and the computer will get angry with you!

On your screen, you will see two feet jogging along a dangerous trail with a variety of hazards coming at them. One object of Joggers is to avoid jogging where your sensitive feet might get hurt. This means avoiding the junk! After a completed game, you will be informed of how many mistakes you made and the game difficulty status. It is at this time that you may change the difficulty level.

Changing the Difficulty

Because there were so many possible variables in the making of a difficulty level, I chose the simple approach and left word commands to control everything, from the objects-per-step to the vertical starting position. My recommendation is that you experiment at changing the difficulty level. Combinations can range from simple to downright impossible.

Have fun and enjoy Joggers! ■

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Joggers

```
10 GOTO 850'BDMX
20 :'ABHX
30 SYS 49152:REM GAME LOOP'COQD
40 :'ABHA
50 REM ***** SOUND EFFECTS'BRIF
60 MS=PEEK(53287)-241:VP=PEEK(S+1)
   :IF PEEK(835)=85 THEN 110'KFHP
70 GOSUB 820:POKE 54277,8
   :POKE 54278,255:POKE 54276,21
   :T=255'FKAN
80 FOR Z=1 TO 50:POKE 54287,T'EMIJ
90 FOR I=155 TO 50 STEP-25
   :POKE 54273,I:T=T-1:NEXT I,Z
   :POKE 54278,15:POKE 54296,0'LQVU
100 LO=LO+1:GOTO 160'DJDY
110 GOSUB 820:POKE 54277,8
    :POKE 54278,255:POKE 54276,21
    :T=0'FIXF
120 FOR Z=10 TO 140 STEP 20
    :FOR I=0 TO 250 STEP 6:POKE S+39,I
    :POKE 54287,Z:POKE 54273,I'MMPM
130 NEXT I,Z:POKE 54296,0
    :POKE 54278,15:WO=WO+1'FBIH
140 :'ABHY
150 REM ***** SCORE & REPLAY'BRHE
160 PRINT"[CLEAR]":POKE 53272,21
    :POKE S+1,0'EOJG
170 IF PEEK(835)=85 THEN 250'EKEG
180 IN=IN+1:IF IN=6 THEN IN=1'GMGK
190 IF IN=1 THEN PRINT"[CLEAR]SORRY,
     YOU JOG LIKE A YOUNG RADICAL
    WHI-PPERSNAPPER!"'EDAV
200 IF IN=2 THEN PRINT"[CLEAR]
    YOU JOG LIKE AN ELDERLY WOMEN
    WITH HIGH HEEL SHOES!"'EDDN
210 IF IN=3 THEN PRINT"[CLEAR]
    YOU JOG LIKE OLD MAN WITH A WHITE
    RED[SPACE3]TIPED CANE!"'EDVN
220 IF IN=4 THEN PRINT"[CLEAR]
    YOU HAVE TO LEARN TO WALK,
     BEFORE YOU[SPACE3]CAN JOG!"'EDXO
230 IF IN=5 THEN PRINT"[CLEAR]
    PERHAPS A LOWER LEVEL OF
```

```
     DIFFICULTY, IF THERE IS
     ONE..."'EDQR
240  GOTO 320'BDEB
250  PRINT"[CLEAR]CONGRATULATIONS,
     [SPACE2]YOU SURVIVED THE JOG
     "'BALM
260  PRINT"WITH ONLY ";'BBDF
270  IF MS=0 THEN PRINT"[HOME,DOWN]
     WITH ZERO MIS-STEPS!"'EDEM
280  IF MS=1 THEN PRINT"ONE MIS-STEP!
     "'EDMK
290  IF MS>1 AND MS<5 THEN PRINT MS;
     " MIS-STEPS!"'GJCO
300  IF MS>4 THEN PRINT"[HOME,DOWN]
     WITH A TOTAL OF";MS;
     " MIS-STEPS!"'EHWI
310  IF VP<50 THEN PRINT"[CLEAR]
     CHEATERS NEVER PROSPER!":WO=WO-1
     :LO=LO+100'ISCO
320  PRINT"---------------------------
     ------------"'BAEG
330  PRINT"[DOWN]TOTAL GAMES WON
     :";WO'BDWF
340  PRINT"[DOWN]TOTAL GAMES LOST
     :";LO'BDJH
350  PRINT"[DOWN]CURRENT O.P.S: ";
     :IF OPS=1 THEN PRINT"HIGH"'FGSL
360  IF OPS=2 THEN PRINT"MEDIUM"'EEDI
370  IF OPS=3 THEN PRINT"LOW"'EEAI
380  PRINT"[DOWN]VERTICAL STATUS
     : ";'BBVK
390  IF VP>49 AND VP<100 THEN
     PRINT"BEGINNER"'GJVO
400  IF VP>99 AND VP<150 THEN
     PRINT"INTERMEDIATE"'GJJH
410  IF VP>149 THEN PRINT"PROFESSIONAL
     "'EFVG
420  IF VP<50 THEN PRINT"NO
     ANSWER"'EEEG
430  PRINT"[DOWN]LENGTH OF GAME: ";
     :IF LG=1 THEN PRINT"SHORT"'FFNL
440  IF LG=2 THEN PRINT"MEDIUM"'EDJH
450  IF LG=3 THEN PRINT"LONG"'EDSH
460  IF LG=255 THEN PRINT"ETERNAL"'EFOJ
470  FOR I=0 TO 9:GET A$:NEXT'FHHJ
480  PRINT"[DOWN]PRESS [RVS]F1[RVOFF]
      TO CHANGE O.P.S."'BAWN
490  PRINT"[DOWN]PRESS [RVS]F3[RVOFF]
      TO CHANGE VERTICAL STATUS"'BACR
500  PRINT"[DOWN]PRESS [RVS]F5[RVOFF]
      TO CHANGE LENGTH OF GAME"'BAKI
510  PRINT"[DOWN]PRESS [RVS]F7[RVOFF]
      TO END THE GAME"'BADH
520  PRINT"[DOWN,RVS]PRESS ANY OTHER
     KEY TO PLAY AGAIN[RVOFF]"'BAQL
530  GOSUB 820:POKE V+5,8:POKE V+6,255
     :POKE V+4,21:POKE V+24,5'JCON
540  IF VP<50 THEN VP=50'EIWH
550  GET A$:A=INT(RND(TI)*255):POKE V,A
     :POKE V+1,A:POKE V+4,33
     :POKE V+4,32'MJOT
560  IF A$=""THEN 550'DFBH
570  GOSUB 820:IF A$<>"[F1]
     "THEN 620'FJVL
580  PRINT"[UP]DO YOU WANT A [RVS]L
     [RVOFF]OW[SPACE2,RVS]M[RVOFF]
     EDIUM OR [RVS]H[RVOFF]
     IGH OBJECTPER STEP RATING?"'BAEA
590  GET B$:IF B$<>"L"AND B$<>"M"AND
     B$<>"H"THEN 590'LMBS
600  OPS=1:SPO=3:IF B$="M"THEN OPS=2
     :SPO=2'HVHK
610  IF B$="L"THEN OPS=3:SPO=1'FLYH
620  IF A$<>"[F3]"THEN 680'EFGG
630  PRINT"[UP]DO YOU WANT [RVS]B
     [RVOFF]EGINNING [RVS]I[RVOFF]
     NTERMEDIATE OR[RVS]P[RVOFF]
     ROFESSIONAL STATUS?"'BAJW
640  GET B$:IF B$<>"B"AND B$<>"I"AND
     B$<>"P"THEN 640'LMQO
650  VP=50:IF B$="I"THEN VP=VP+50'GNBM
660  IF B$="P"THEN VP=VP+100'FJLL
670  SM=VP'BEWI
680  IF A$<>"[F5]"THEN 740'EFEM
690  PRINT"[UP]DO YOU WANT A [RVS]S
     [RVOFF]HORT [RVS]M[RVOFF]EDIUM
     [SPACE2,RVS]L[RVOFF]ONG OR[SPACE5,
     RVS]E[RVOFF]TERNAL GAME?"'BAEB
700  GET B$:IF B$<>"S"AND B$<>"M"AND
     B$<>"L"AND B$<>"E"THEN 700'OOPO
710  LG=1:IF B$="M"THEN LG=2'FJPH
720  IF B$="L"THEN LG=3'EFPH
730  IF B$="E"THEN LG=255'EHMI
740  IF A$="[F7]"THEN END'ECGI
750  FOR I=1 TO 40:PRINT:NEXT:VP=SM
     :GOSUB 780:POKE 53272,
     (PEEK(53272)AND 240)+12'LLXU
755  GOTO 30'BCKL
760  :'ABHH
770  REM ***** RESET OPS &
     VERTICAL'BWKO
780  POKE 835,LG:POKE 832,OPS
     :POKE 833,0:POKE 834,0
     :POKE 53287,241:POKE S+1,VP'HRJW
790  POKE 830,0:POKE S+16,0
     :POKE 836,SPO:POKE 53248,150
     :RETURN'GFQU
800  :'ABHC
810  REM ***** SOUND CHIP CLEAR'BTQI
820  FOR I=54272 TO 54295:POKE I,0:NEXT
     :POKE 54296,15:RETURN'HBWN
830  :'ABHF
840  REM ***** GAME SET UP'BOMK
850  POKE 53281,0:POKE 53280,0
     :PRINT"[CLEAR]";TAB(15)"[RED,RVS]
     JOGGERS![RVOFF,BLUE,SHFT M]"'EUXR
860  PRINT TAB(15)"[CMDR *,RVS,SPACE7,
     CMDR *,RVOFF,CMDR G,YELLOW,DOWN3]
     "'CDKO
870  PRINT TAB(10)"BY. STEVEN PROPER
     [DOWN2]"'CDWP
880  PRINT TAB(10)"HOLD [RVS]F[RVOFF]
      TO GO LEFT[DOWN]"'CDRO
890  PRINT TAB(10)"HOLD [RVS]J[RVOFF]
      TO GO RIGHT[DOWN]"'CDYS
900  PRINT TAB(10)"PRESS [RVS]K[RVOFF]
```

```
     TO JUMP[DOWN2]"'CDAJ
910 PRINT TAB(6)"PLEASE WAIT,[SPACE2]
    LOADING DATA..."'CCPM
920 FOR T=12288 TO 12414:READ DA
    :POKE T,DA:NEXT:I=0'HXEO
930 READ A:IF A=2040 THEN 950'EKNK
940 POKE 49152+I,A:I=I+1:GOTO 930'FQEN
950 POKE 56334,PEEK(56334)AND 254
    :POKE 1,PEEK(1)AND 251'GABQ
960 FOR I=0 TO 7:POKE I+12544,0
    :NEXT'GNXP
970 FOR I=0 TO 55:READ A:PRINT
    :POKE I+12416,A:NEXT'IRVS
980 POKE 1,PEEK(1)OR 4:POKE 56334,
    PEEK(56334)OR 1'GVXT
985 POKE 53272,(PEEK(53272)AND
    240)+12'EUBW
990 POKE 52,48:POKE 56,48:CLR:OPS=2
    :VP=50:SM=50:S=53248
    :POKE S+21,3'JPNC
1000 V=54272:LG=1:SPO=2:GOSUB 780
     :GOSUB 820:GOTO 30'GBJC
1010 :'ABHT
1020 REM ***** SPRITE DATA'BPGY
1030 DATA 62,0,0,127,0,0,255,0,0'BWKA
1040 DATA 254,0,0,252,0,0,252,0,0'BXHB
1050 DATA 252,0,0,254,0,124,255,0,
     254'BCOD
1060 DATA 127,0,255,62,0,127,128,64,
     63'BDHE
1070 DATA 42,192,63,10,192,63,0,0,
     127'BCXF
1080 DATA 0,0,255,0,0,254,0,0,124'BXIF
1090 DATA 0,2,1,0,3,84,0,3,80,0'BVHG
1100 DATA 0,0,124,0,0,254,0,0,255'BXIX
1110 DATA 0,0,127,0,0,63,0,0,63'BVKY
1120 DATA 62,0,63,127,0,127,255,0,
     255'BCAB
1130 DATA 254,0,254,252,0,124,252,2,
     1'BCOC
1140 DATA 252,3,84,254,3,80,255,0,
     0'BABD
1150 DATA 255,0,0,126,0,0,60,0,0'BWHD
1160 DATA 128,64,0,42,192,0,10,192,
     0'BBSF
1170 :'ABHB
1180 REM ***** MACHINE LANGUAGE'BUDH
1190 DATA 169, 0, 141, 24, 212, 169,
      1, 141, 0'BDSI
1200 DATA 212, 141, 1, 212, 169, 33,
      141, 4, 212'BFGB
1210 DATA 169, 32, 141, 4, 212, 169,
      15, 141, 24'BFWC
1220 DATA 212, 238, 65, 3, 173, 65, 3,
      201, 255'BEBD
1230 DATA 208, 8, 169, 0, 141, 65, 3,
      238, 66'BCSD
1240 DATA 3, 173, 66, 3, 205, 67, 3,
      208, 6'BALE
1250 DATA 169, 85, 141, 67, 3, 96,
      173, 248, 7'BDFG
1260 DATA 201, 192, 208, 5, 169, 193,
      76, 74, 192'BGUH
1270 DATA 169, 192, 141, 248, 7, 165,
      203, 201, 34'BHFI
1280 DATA 208, 35, 174, 0, 208, 224,
      62, 208, 10'BFTJ
1290 DATA 174, 16, 208, 224, 1, 208,
      3, 76, 118'BEDK
1300 DATA 192, 173, 0, 208, 24, 105,
      8, 141, 0'BDVB
1310 DATA 208, 201, 20, 176, 5, 169,
      1, 141, 16'BETD
1320 DATA 208, 201, 21, 208, 45, 174,
      0, 208, 224'BGPE
1330 DATA 30, 208, 10, 174, 16, 208,
      224, 1, 240'BFKF
1340 DATA 3, 76, 167, 192, 173, 0,
      208, 56, 233'BELG
1350 DATA 8, 141, 0, 208, 173, 16,
      208, 201, 1'BDSG
1360 DATA 208, 12, 173, 0, 208, 201,
      100, 144, 5'BFEI
1370 DATA 169, 0, 141, 16, 208, 201,
      37, 208, 17'BFWJ
1380 DATA 174, 1, 208, 224, 50, 144,
      10, 162, 0'BEKK
1390 DATA 232, 238, 1, 208, 224, 32,
      208, 248, 201'BHTL
1400 DATA 4, 240, 3, 76, 204, 192,
      164, 203, 192'BFYD
1410 DATA 1, 208, 250, 76, 204, 192,
      162, 0, 232'BFRE
1420 DATA 169, 17, 32, 210, 255, 236,
      64, 3, 208'BFFF
1430 DATA 245, 32, 158, 224, 165, 98,
      201, 135, 176'BIOG
1440 DATA 247, 56, 233, 112, 141, 63,
      3, 32, 158'BFAH
1450 DATA 224, 165, 98, 56, 233, 128,
      201, 40, 176'BHLI
1460 DATA 244, 168, 173, 63, 3, 153,
      191, 7, 56'BEPJ
1470 DATA 233, 15, 153, 191, 219, 173,
      31. 208, 201'BIUK
1480 DATA 1, 240, 3, 76, 0, 192, 238,
      62, 3'BACK
1490 DATA 173, 68, 3, 205, 62, 3, 208,
      15, 169'BDPL
1500 DATA 0, 141, 62, 3, 238, 39, 208,
      173, 39'BDMD
1510 DATA 208, 201, 250, 240, 3, 76,
      0, 192, 96,0,0,2040'BNSG
1520 :'ABHA
1530 REM ***** CUSTOM CHARACTERS'BVCH
1540 DATA 0,60,126,255,24,24,24,
     24'BYAH
1550 DATA 24,16,16,108,254,254,124,
     56'BCMI
1560 DATA 192,3,0,48,0,6,0,48'BTKI
1570 DATA 126,129,165,129,153,165,129,
     126'BGQL
1580 DATA 0,0,0,97,243,223,12,0'BVVK
1590 DATA 60,126,255,255,255,255,126,
     60'BELN
1600 DATA 8,8,8,8,8,8,8,62'BQQC
```

END

BY BUCK CHILDRESS

Pachyderm Panic

for the Commodore 64

An elephant never forgets. How about you? Pachyderm Panic is a challenging game for one or two players that tests concentration and recall.

The game begins by asking for the number of players and their names. It will default to one player if nothing is entered. The default names are PLAYER 1 and PLAYER 2. Eight elephants will then appear on the screen, waiting to test your memory. The computer will randomly flash some of them and you must match the computer's choices by pressing the corresponding number key.

You get one point for every correct match. If you correctly match all of the elephants, you receive a double bonus. For example, if the computer chooses four elephants and you match them all, you get four points plus a four-point bonus.

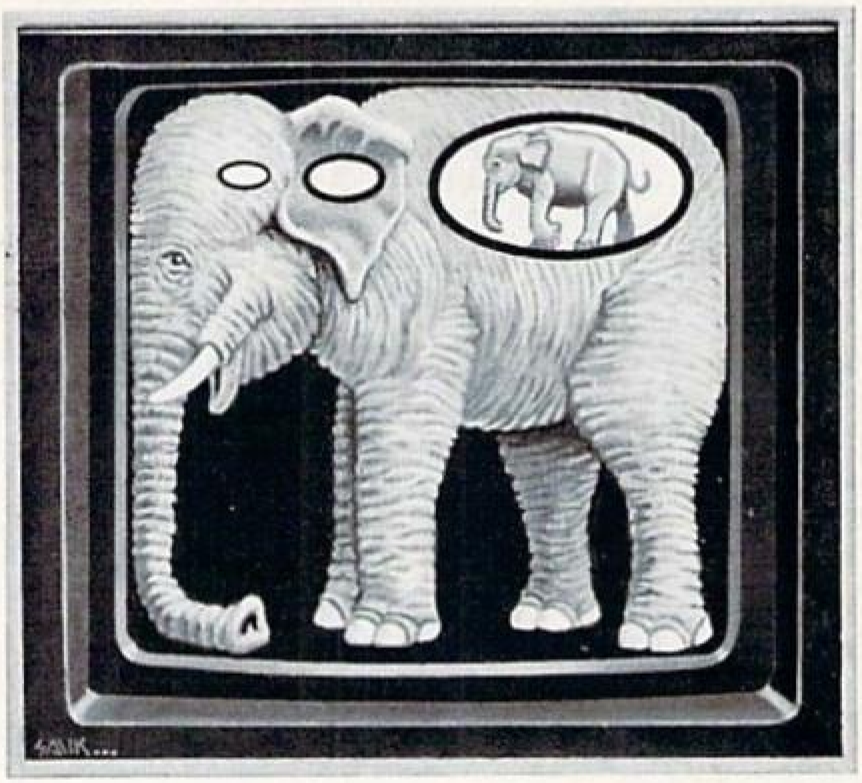
If you match all the elephants, the game will then increase the number of choices by one. If you fail to match them all, you still receive one point for each correct match, but no bonus is awarded, and the program then decreases the choices by one.

As an added challenge, there is a time limit for entering your choices. You have four seconds to match two, eight seconds to match four, and so on. Should time run out, you forfeit the rest of your turn.

You can change a selection by pressing any key except one through eight. This cancels your last entry and lets you make a new choice. When you have finished choosing, just wait. Pacyhderm Panic will see that you are done and check your selections. Don't press RETURN or you'll erase your last answer.

A player wins by accumulating a minimum of 50 or a maximum of 100 points, depending on the level of play. If two are playing, the game makes sure that both players have had the same number of turns before a winner is declared. ■

LEVEL OF PLAY	MINIMUM CHOICES	MAXIMUM CHOICES	POINTS TO WIN
1	2	4	50
2	3	6	75
3	4	8	100



An elephant never forgets, but how about you? Here's a game to test your concentration and recall.

Before typing this program, read "How to Enter Programs" and "How to Use the Magazine Entry Program." The BASIC programs in this magazine are available on disk from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007, 1-800-831-2694.

Pachyderm Panic

```
15 POKE 53280,12:POKE 53281,15'CRQG
20 PRINT"[CLEAR,BLACK]CHECKING DATA";
   :FOR J=1 TO 131:READ A:X=X+A
   :NEXT J'IPRL
30 IF X<>14735 THEN PRINT"[SPACE2]
   ERROR":STOP'GHKG
35 PRINT"[SPACE2]OK":RESTORE'CBIG
40 B$="[RIGHT3]":C$="[HOME,DOWN4]"
   :D$="[HOME,DOWN19]"'DITF
50 E$="[SPACE40]"'BCBH
60 F$="[DOWN2,RIGHT3]":V=54272
   :POKE V+24,15:P=53248:X=0'GBOM
70 POKE 198,0:GOSUB 500
   :IF NP=2 THEN GOSUB 820
   :GOSUB 350'HUAL
80 GOSUB 840:GOSUB 350:GOSUB 390
   :R=1'EOOJ
90 L=L+1:T=L:H=L*2:P1=T:P2=T:Y=L*25
   :D=1'KBAS
100 REM *** COMPUTER CHOOSES ***'BVOB
110 FOR J=1 TO T'DDPX
120 N=INT(RND(1)*8)+1:A(J)=N'GOYE
130 POKE 251,J:POKE 252,N:SYS 49152
    :IF PEEK(252)<>N THEN 120'ICTI
140 POKE 49999+J,N:POKE P+38+N,1
    :S=A(J):GOSUB 1000'HBYJ
150 GOSUB 395:NEXT J:GOSUB 700'DJUD
200 REM *** PLAYER INPUT ***'BRGA
205 TS=TI:TF=T*2:FOR J=1 TO T
    :POKE 198,0'HTRK
210 GET A$:IF(TI-TS)/60>=TF THEN J=T
    :NEXT J:GOSUB 1200:GOTO 340'LBBJ
220 IF A$=""THEN 210'DFTA
230 S=VAL(A$):IF S<1 OR S>8 THEN IF
    J>1 THEN POKE P+38+B(J-1),E:J=J-1
    :GOTO 210'RFNQ
240 IF S<1 OR S>8 THEN 210'FHGE
250 POKE P+38+S,C:POKE 198,0
    :GOSUB 1000:IF J=T THEN FOR I=1
    TO 75'LYFN
```

```
260 IF PEEK(198)=1 AND J=T THEN IF
    PEEK(631)<49 OR PEEK(631)>56 THEN
    290'NATP
270 IF J=T THEN NEXT I'EDBG
280 B(J)=S:NEXT J:GOSUB 700
    :GOTO 300'EPFJ
290 I=100:NEXT I:POKE P+38+S,E
    :POKE 198,0:GOTO 210'HXOO
300 REM *** COMPARE INPUT AND
    CALCULATE THE SCORE ***'BNXH
305 X=0:FOR J=1 TO T:IF
    B(J)<>A(J)THEN X=X+1'KSXM
310 NEXT J:IF X=0 THEN SC=SC+T*2
    :GOSUB 1100:GOTO 350'JTQI
315 PRINT C$B$"[RVOFF,WHITE]
    ELEPHANT SAID:"C$TAB(17);
    :FOR J=1 TO T:S=A(J)'GURP
320 POKE P+38+S,1:PRINT S;:GOSUB 1000
    :GOSUB 395:NEXT J:GOSUB 700
    :GOSUB 395'JDOK
325 PRINT D$B$K$P$" SAID:"D$TAB(17);
    :FOR J=1 TO T:S=B(J)'GYGO
330 POKE P+38+S,C:PRINT S;:GOSUB 1000
    :GOSUB 395:NEXT J:GOSUB 395'IYNK
335 SC=SC+T-X'DGWI
340 IF T>L THEN T=T-1'FFJF
350 PRINT SC$SC:IF R=0 THEN
    RETURN'FIXH
355 GOSUB 700:GOSUB 395
    :IF NP=1 THEN VS=SC:GOTO 370'HTXP
360 IF D=1 THEN VS=SC:GOTO 375'FKVI
365 HS=SC'BEBJ
370 IF VS>=Y OR HS>=Y THEN IF VS<>HS
    THEN 900'LNRP
375 IF NP=2 THEN D=-D:GOSUB 800'GJWO
380 PRINT C$E$D$E$:SYS 49174:GOSUB 390
    :GOTO 100'EWJL
390 FOR I=1 TO 500:NEXT I:RETURN'FIDK
395 FOR I=1 TO 200:NEXT I:RETURN'FIAP
500 REM *** NUMBER OF PLAYERS, LEVEL,
     AND NAMES ***'BLGJ
510 NP=1:PRINT F$"NUMBER OF PLAYERS
    (1-2)";:INPUT NP'DKPK
515 IF VAL(CHR$(NP+48))<1 OR
    VAL(CHR$(NP+48))>2 THEN 510'LVDR
520 L=1:PRINT F$"LEVEL: 1=EASY[SPACE2]
    2=MEDIUM[SPACE2]3=HARD";
    :INPUT L'DIYM
525 IF VAL(CHR$(L+48))<1 OR
    VAL(CHR$(L+48))>3 THEN 520'LTVR
530 P1$="PLAYER 1":PRINT F$"NAME OF
    PLAYER 1 ";:INPUT P1$'DLCM
540 P1$=LEFT$(P1$,8)'CKUG
550 IF NP=1 THEN 580'DGEH
560 P2$="PLAYER 2":PRINT F$"NAME OF
    PLAYER 2 ";:INPUT P2$'DLGP
570 P2$=LEFT$(P2$,8)'CKWJ
580 PRINT"[CLEAR]SETTING UP"'BAZL
600 REM *** SPRITES ***'BNFD
610 FOR J=2040 TO 2047:POKE J,13
    :NEXT J'FQAH
620 FOR J=1 TO 30:READ A:NEXT J'FING
630 FOR J=832 TO 832+62:READ A
    :POKE J,A:NEXT J'HRCK
640 POKE P,48:POKE P+1,100
    :POKE P+2,112:POKE P+3,100'HAAN
650 POKE P+4,184:POKE P+5,100
    :POKE P+6,248:POKE P+7,100'ICMP
660 POKE P+8,48:POKE P+9,148
    :POKE P+10,112:POKE P+11,148'IDQR
670 POKE P+12,184:POKE P+13,148
    :POKE P+14,248:POKE P+15,148'IGSS
680 POKE P+28,255:POKE P+37,7
    :POKE P+38,12'GUGQ
690 POKE P+29,255:POKE P+23,255'EPMO
700 E=0'BCNC
710 FOR J=P+39 TO P+46:POKE J,E:NEXT J
    :IF R=1 THEN RETURN'LQVM
720 PRINT"[CLEAR]":POKE P+21,255'DIJH
730 REM *** PRINT NUMBERS IN THE
    SPRITES ***'BFNM
740 PRINT"[BLACK,RVS,HOME,DOWN8,
    RIGHT6]1[RIGHT7]2[RIGHT8]3[RIGHT7]
    4"'BAIK
750 PRINT"[RVS,DOWN5,RIGHT6]5[RIGHT7]
    6[RIGHT8]7[RIGHT7]8[RVOFF]"'BAGL
760 REM *** LOAD ML (KEEP COMPUTER
    FROM DUPLICATING INPUT) ***'BVHU
770 FOR J=49152 TO 49189:READ A
    :POKE J,A'FRPO
780 NEXT J:RESTORE:RETURN'DDOL
800 REM *** CHANGE SIDES ***'BRSG
810 IF D=1 THEN 840'DFTF
820 P$=P2$:SC=HS:P2=T:T=P1:C=6
    :K$="[BLUE]"'GYYO
830 SC$="[BLUE,HOME,RIGHT21,RVS]
    "+P2$+"[SPACE2]":RETURN'EHTM
840 P$=P1$:SC=VS:P1=T:T=P2:C=2
    :K$="[RED]"'GYFQ
850 SC$="[RED,HOME,RIGHT4,RVS]"+P1$+"
    [SPACE2]":RETURN'EHIM
900 REM *** VICTORY ***'BNLG
910 PRINT C$E$D$E$'BIHG
920 IF VS>HS OR NP=1 THEN C=2
    :GOTO 940'HNWM
930 C=6'BCRH
940 FOR X=1 TO 3:E=C:GOSUB 1300
    :NEXT X'GNPN
950 PRINT D$TAB(12)"[RVOFF,BLACK]
    PRESS ANY KEY"'CFCO
960 GET A$:IF A$=""THEN 960'EION
970 POKE P+21,0:RUN'DGUN
1000 REM *** SOUND OF COMPUTER AND
     PLAYER INPUT ***'BKVD
1010 FOR I=0 TO 23:POKE V+I,0
     :NEXT I'GLWA
1020 POKE V+1,S+25:POKE V+6,240
     :POKE V+4,21'HTFD
1030 FOR I=1 TO 100:NEXT I:POKE V+4,20
     :RETURN'HOPD
1100 REM ***SOUND AND VISUAL EFFECTS
     AFTER CORRECT INPUT ***'BTGG
1110 FOR I=0 TO 23:POKE V+I,0
     :NEXT I'GLWB
1120 POKE V+6,240:FOR N=1 TO 2
     :FOR I=1 TO T:E=1:GOSUB 1170'KWIH
```

```
1130 NEXT I:FOR I=T TO 1 STEP-1:E=C
     :GOSUB 1170:NEXT I'JQFG
1140 NEXT N:FOR I=1 TO T:E=1
     :GOSUB 1170:NEXT I'HPPF
1150 IF T<H THEN T=T+1'FFGD
1160 RETURN'BAQA
1170 POKE V+4,21:POKE P+38+B(I),E
     :POKE V+1,I+25'IWPL
1180 FOR N1=1 TO 5:NEXT N1:POKE V+4,20
     :RETURN'HOGJ
1200 REM *** BUZZER (TIMES UP)
     ***'BVDA
1210 FOR I=V TO V+23:POKE I,0
     :NEXT I'GLKC
1220 PRINT C$TAB(11)"[BLACK]SORRY,
      TIMES UP."'CFTE
1230 POKE V+1,7:POKE V+6,130
     :POKE V+4,33'GRLF
1240 GOSUB 395:POKE V+4,32:RETURN'EKOD
1300 REM *** VICTORY TUNE ***'BRVA
1310 FOR I=V TO V+23:POKE I,0:NEXT I
     :POKE V+5,30:POKE V+6,85'KXNI
1320 POKE V+12,85:POKE V+13,85
     :GOSUB 710'FRQE
1330 FOR I=1 TO 6:READ A,A1,A2,A3,A4
     :POKE V+4,33:POKE V+11,17'IFAK
1340 POKE V+1,A:POKE V,A1:POKE V+8,A2
     :POKE V+7,A3:FOR N=1 TO A4'KBDM
1350 NEXT N:POKE V+4,32:POKE V+11,16
     :NEXT I:IF X<3 THEN GOSUB 700'KWEL
1360 FOR N=1 TO 100:NEXT N:RESTORE
     :RETURN'GJBH
1400 REM *** VICTORY TUNE DATA
     ***'BVRD
1410 DATA 25,30,18,209,50,33,135,25,
     30,50,42'BJCF
1420 DATA 62,31,165,50,50,60,37,162,
     130,42'BHNF
1430 DATA 62,31,165,50,50,60,37,162,
     165'BEAG
1500 REM *** SPRITE DATA ***'BQXC
1510 DATA 5,0,0,10,0,0,85,80,0,63,192,
     0,59,234,128'BPDH
1520 DATA 59,234,188,255,234,191,255,
     224,179,255,224,176'BVIJ
1530 DATA 195,224,176,243,224,176,243,
     234,176,3,234,176'BUSK
1540 DATA 3,213,112,3,255,240,3,243,
     240,2,162,160'BOLJ
1550 DATA 2,162,160,0,0,0,0,0,0,0,0,
     0'BCUI
1600 REM *** ML DATA ***'BMLC
1610 DATA 160,0,165,252,217,80,195,
     240,8,200,196'BNPH
1620 DATA 251,240,7,76,4,192,169,0,
     133,252,96'BKAI
1630 DATA 160,0,169,0,153,80,195,200,
     192,8,240,3,76,26,192,96'BBRM
```

END

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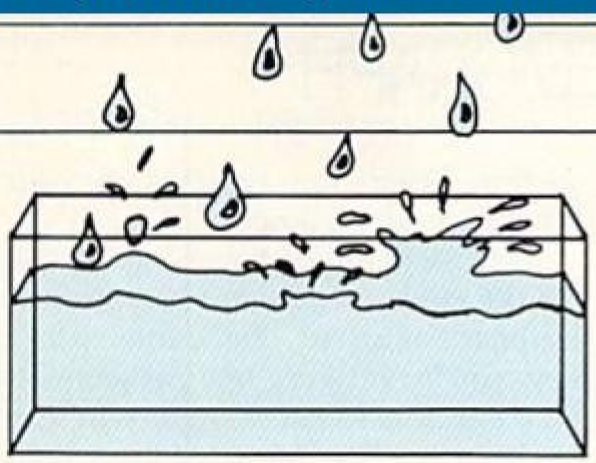


BY R. HAROLD DROID

Memgraph

for the Commodore 64

Get a graphic representation of how much memory your program is using.

One mark of programming efficiency is how well the computer's available space is used. Here's a program that gives you a graphic representation of how much memory your program is gobbling up and what sort of information the computer is putting there. BASIC divides its 38K of available space in the Commodore 64 into five areas: program text, variables, array variables, free space, and string space. It keeps track of where each section begins and ends via a table of pointers at addresses 43-52. When variables are created or changed, these pointers change, too. With Memgraph enabled, press the SHIFT and RESTORE keys together to check these pointers and view a graphic display of BASIC memory. Press the SHIFT key to resume the program.

Memgraph is a machine-language program which starts at 51456. This is in an upper area of the free RAM that starts at the familiar address of 49152. The location is high enough to avoid conflicts with BASIC programs which have supporting machine-language routines. However, it also leaves enough room above to hold the standard DOS wedge.

The "Memgraph Loader" program creates the machine-language file on disk. Once the loader is typed in and saved, you're ready to use the program, so type LOAD "MEMGRAPH",8,1 to put the program into computer memory. Loading Memgraph will change the BASIC pointers, so type NEW to reset them. Now, type SYS51456 to put Memgraph into operation. The graph is available at any time by pressing SHIFT/RESTORE. To disable Memgraph, use the RUN-STOP/RESTORE combination. From a warm reset, the program can be enabled again with SYS51456.

The screen display is set up for a color monitor and looks washed-out on a monochrome monitor. Color codes for the graphic screen are in a table at the end of the program and are easily changed. The color codes start at address 52194 and affect background, border, text, and the block colors for program text, variables, arrays, free space, and strings. The program entitled "Modify B/W" will load the machine-language file, alter it, and save a new version to disk with improved black-and-white graphics.

Each filled space represents a block of 256 bytes. After a program loads and before it runs, only the program text area is colored in. As it proceeds, the other areas begin to fill. Simple variables, numeric or integer, require seven bytes. Arrays take seven to eleven bytes to describe the array and two to five bytes for each element, depending on the type of variable involved. Unless huge arrays are involved, these areas are relatively small. You may be surprised, though, at how fast the string space fills during some programs.

Here's how strings are handled by the 64. When you create a string variable, information is stored in two places: a pointer to the location of the string in the variables area, and the actual string text in the string area. Unlike the other areas, which fill from the bottom of memory up, the computer builds the string area from the top of memory down.

Memgraph Program Notes

Memgraph wedges itself into the non-maskable interrupt (nmi) of the Commodore 64. In contrast to the maskable interrupt, which calls the keyboard scan and updates the clock, the nmi cannot be disabled, since the RESTORE key is connected directly to the microprocessor chip. One can, however, affect the results of an nmi by changing vectors. In the case of Memgraph, the nmi vector at $318 is changed, and points to the graphing routine.

Program Notes

First, a flag is checked. This flag is set whenever the graph routine is running; it keeps Memgraph from interrupting itself. Then, by writing to and reading from the control ports that read the keyboard, we check the SHIFT key. Doing it this way, instead of using the kernal keyboard scan, makes sure that we don't foul up any BASIC input. If the flag is set or the SHIFT key is not pressed, we jump directly to the kernal nmi routine (which checks the stop key, checks for an auto-start cartridge and performs RS-232 I/O).

If our conditions are met, the kernal ROM is banked out, background and border colors are saved and the entire color RAM copied to the RAM underlying BASIC. The VIC chip is set to see the screen memory at $A000, also under the BASIC kernal. We write the graph screen text to the new screen, fill the graph area with graphic characters (screen code 207, reversed shifted O's), and fall to the next routine.

Drawing the graph itself is quite straightforward. We subtract each BASIC pointer from the value of the pointer above it and write that many bytes of color code to the color RAM. The x-register keeps track of how many bytes of an individual color are required, while the y-register keeps track of where we are on the screen. When the y-register reaches the end of a line, 40 is added to the screen pointer to drop to the next row. Each reverse space on the screen corresponds to one 256-byte boundary in the BASIC work area.

The program then "idles" while the SHIFT keys are checked. First, we make sure the key has been released and then wait until it's been pressed again. That's the signal to copy all the color codes back, reset the VIC chip to see the BASIC screen, zero the flag, and continue the nmi routine, which returns to BASIC. ◼

When a string is redefined, it's not removed from memory. The new string is just tacked onto the bottom of the string area and the pointer changed. So the top part of the string text area is filled with old strings that are no longer needed. When the computer runs out of room, a "garbage collection" goes through the string space looking for those old strings which are no longer defined, deletes them, and crunches the active strings into the top of memory.

When you're dealing with large programs which use lots of variables and many active strings, garbage collections can eat processing time. If Memgraph shows your string space alternately nudging against the arrays and leaving one or two blocks free, garbage collections are taking your computer out to lunch.

Because Memgraph runs off the RESTORE key interrupt and uses its own keyboard scan to check the SHIFT key, you'll find very few programs it won't be able to check up on and leap back into. The Memgraph screen hides under the BASIC ROM to keep it from interfering with the BASIC display, and the color RAM is copied and restored with every viewing. The only programs which cause problems are those that do their own doctoring on the RESTORE key interrupt. For instance, sometimes a programmer will disable the RUN-STOP/RESTORE combination, usually with a POKE792,193. You can reenable it with POKE792,71. And of course, because the program uses the BASIC pointers to draw the graph, at least part of the program must be in BASIC.

Memgraph has some very practical uses if you're designing a program which uses large arrays and manipulates lots of strings, like a data base. You can get a good handle on how large an array you can create and how many strings can be active before you encounter an "out of memory" message and an hour of data entry goes down the tube.

But even if you don't write programs that strain your computer's capacity, type Memgraph in and watch it run on a couple of programs. You'll instantly get a better handle on how the 64 uses and manages its resources. ■

Before typing these programs, read "How to Enter Programs," and "How to Use the Magazine Entry Program." The BASIC programs in this magazine are available on disk from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007, 1-800-831-2694.

Memgraph Loader

```
20 FOR A=51456 TO 52201:READ B
   :POKE A,B:CHK=CHK+B:NEXT'IBRI
30 IF CHK<>90580 THEN PRINT"ERROR IN
   DATA STATEMENTS":END'GJYL
35 POKE 43,0:POKE 44,201:POKE 45,0
   :POKE 46,203'EXCK
36 SAVE"MEMGRAPH",8,1'BEXI
37 SYS 58260'BFMH
40 END'BACA
51456 DATA 169,16,141,24,3,169,201,
      141'BCGK
51464 DATA 25,3,169,0,141,234,203,
      96'BAIJ
51472 DATA 72,138,72,152,72,173,234,
      203'BDNI
51480 DATA 208,5,32,250,202,176,3,
      76'BAIH
51488 DATA 76,254,169,1,141,234,203,
      165'BDOP
51496 DATA 1,41,254,133,1,173,33,
      208'BAYO
51504 DATA 141,235,203,173,32,208,141,
      236'BFUF
51512 DATA 203,169,216,141,81,201,141,
      95'BEBE
51520 DATA 201,169,184,141,84,201,169,
      160'BFHD
51528 DATA 141,89,201,162,4,160,0,
      185'BBFK
51536 DATA 0,216,153,0,184,169,32,
      153'BBGJ
51544 DATA 0,160,173,228,203,153,0,
      216'BCVI
51552 DATA 200,208,236,202,240,15,238,
      81'BEUI
51560 DATA 201,238,84,201,238,89,201,
      238'BEKH
51568 DATA 95,201,76,77,201,173,226,
      203'BDOO
51576 DATA 141,33,208,173,227,203,141,
      32'BETO
51584 DATA 208,169,132,141,24,208,173,
      0'BDGM
51592 DATA 221,41,252,9,1,141,0,
      221'BYPL
51600 DATA 160,13,185,74,203,41,63,
      153'BCHB
51608 DATA 92,160,136,16,245,160,17,
      185'BDQJ
51616 DATA 88,203,41,63,153,130,160,
      136'BDGI
51624 DATA 16,245,160,11,185,106,203,
      41'BDYH
51632 DATA 63,153,60,162,136,16,245,
      160'BDJG
51640 DATA 8,185,118,203,41,63,153,
      100'BCEF
51648 DATA 162,136,16,245,160,5,185,
      127'BDON
51656 DATA 203,41,63,153,140,162,136,
      16'BDAM
51664 DATA 245,160,9,185,133,203,41,
      63'BCKL
51672 DATA 153,180,162,136,16,245,160,
      6'BDJK
51680 DATA 185,143,203,41,63,153,220,
      162'BEWK
51688 DATA 136,16,245,160,24,185,150,
      203'BEZS
51696 DATA 41,63,153,39,163,136,16,
      245'BCQQ
51704 DATA 160,21,185,175,203,41,63,
      153'BDGG
51712 DATA 79,163,136,16,245,160,28,
      185'BDBF
51720 DATA 197,203,41,63,153,157,163,
      136'BELF
51728 DATA 16,245,169,207,160,18,153,
      210'BEEN
51736 DATA 160,153,250,160,153,34,161,
       153'BFTM
51744 DATA 74,161,153,114,161,153,154,
       161'BFAL
51752 DATA 153,194,161,153,234,161,
       136,16'BFFK
51760 DATA 229,141,58,162,141,98,162,
       141'BEMJ
51768 DATA 138,162,141,178,162,141,
       218,162'BGHR
51776 DATA 173,229,203,141,58,218,173,
       230'BFGQ
51784 DATA 203,141,98,218,173,231,203,
       141'BFXP
51792 DATA 138,218,173,232,203,141,
       178,218'BGIO
51800 DATA 173,233,203,141,218,218,
       169,216'BGGE
51808 DATA 141,42,203,169,210,141,41,
       203'BELM
51816 DATA 160,0,165,46,56,229,44,
       170'BBOK
51824 DATA 173,229,203,32,36,203,165,
       48'BDNJ
51832 DATA 56,229,46,170,173,230,203,
       32'BDJI
51840 DATA 36,203,165,50,56,229,48,
       170'BCSH
51848 DATA 173,231,203,32,36,203,165,
       52'BDBP
51856 DATA 56,229,50,170,173,232,203,
       32'BDGO
51864 DATA 36,203,165,56,56,229,52,
       170'BCTN
51872 DATA 173,233,203,32,36,203,32,
       250'BDVM
51880 DATA 202,176,251,32,250,202,144,
       251'BFPM
51888 DATA 165,1,41,254,133,1,160,
       0'BYTT
51896 DATA 185,0,184,153,0,216,185,
       0'BAGS
51904 DATA 185,153,0,217,185,0,186,
       153'BCOI
51912 DATA 0,218,185,0,187,153,0,
       219'BAJH
51920 DATA 200,208,229,173,0,221,9,
       3'BAAG
51928 DATA 141,0,221,173,235,203,141,
       33'BDPO
51936 DATA 208,173,236,203,141,32,208,
       169'BFFO
51944 DATA 20,141,24,208,165,1,9,
       1'BXEL
51952 DATA 133,1,169,0,141,234,203,
       76'BBCL
51960 DATA 76,254,173,1,220,205,1,
       220'BBWK
51968 DATA 208,248,169,191,141,0,220,
       173'BEFT
51976 DATA 1,220,201,239,240,15,169,
       253'BDBR
51984 DATA 141,0,220,173,1,220,201,
       127'BCHQ
51992 DATA 240,3,24,144,1,56,169,
       127'BAJP
52000 DATA 141,0,220,96,224,0,240,
       12'BAOC
52008 DATA 153,210,212,200,202,192,19,
       240'BFHF
52016 DATA 4,76,36,203,96,160,0,
       72'BXTC
52024 DATA 173,41,203,24,105,40,141,
       41'BCQC
52032 DATA 203,104,144,224,238,42,203,
       76'BEXC
52040 DATA 36,203,42,42,32,77,69,
       77'BYXA
52048 DATA 71,82,65,80,72,32,42,
       42'BXUH
52056 DATA 66,89,32,82,46,32,72,
       65'BXGH
52064 DATA 82,79,76,68,32,68,82,
       79'BXZG
52072 DATA 73,68,80,82,79,71,82,
       65'BXOF
52080 DATA 77,32,84,69,88,84,86,
       65'BXAE
52088 DATA 82,73,65,66,76,69,83,
       65'BXUM
52096 DATA 82,82,65,89,83,70,82,
       69'BXSL
52104 DATA 69,32,83,80,65,67,69,
       83'BXQB
52112 DATA 84,82,73,78,71,83,69,
       65'BXTA
52120 DATA 67,72,32,66,76,79,67,
       75'BXUF
52128 DATA 32,82,69,80,82,69,83,
       69'BXQH
52136 DATA 78,84,83,32,50,53,54,
       66'BXEG
52144 DATA 89,84,69,83,32,79,70,
       32'BXPF
52152 DATA 70,73,76,76,69,68,32,
       77'BXSE
52160 DATA 69,77,79,82,89,80,82,
       69'BXGD
52168 DATA 83,83,32,83,72,73,70,
       84'BXDL
52176 DATA 32,84,79,32,82,69,83,
       85'BXOK
52184 DATA 77,69,32,80,82,79,71,
       82'BXNJ
52192 DATA 65,77,0,0,7,1,5,6'BRTG
52200 DATA 12,2'BERA
```

Modify B/W

```
4 IF FLAG=1 THEN 10'DHSF
5 FLAG=1:LOAD"MEMGRAPH",8,1'CKCI
10 FOR A=52194 TO 52201:READ B
   :POKE A,B:NEXT'GSKE
20 DATA 10,10,0,0,7,6,1,0'BRQB
25 POKE 43,0:POKE 44,201:POKE 45,0
   :POKE 46,203'EXCJ
30 SAVE"MEMGRAPH B/W",8,1'BECD
40 SYS 58260'BFMB
```

END

BY JONATHAN RODDA

56 Sprites

for the Commodore 64

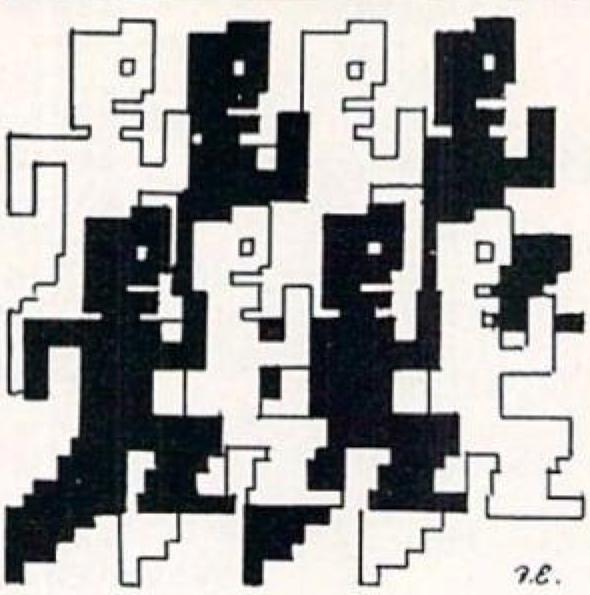
Raster interrupts are a very interesting and powerful feature of the Commodore 64. The program at the end of this article will demonstrate how raster interrupts can be used to display 56 sprites on the screen simultaneously. Among some of the things you will be able to do when you use raster interrupts are: display several background colors on the same screen, display bit-mapped graphics and text simultaneously, and allow the VIC II chip to access more than one 16K bank of memory at the same time.

To understand how raster interrupts work, you need to know a little bit about the way a picture is displayed on a television or monitor. The picture tube has a screen at one end and an electron gun at the other. The inside surface of the screen is coated with a phosphor compound that glows for a fraction of a second when an electron beam strikes it. The electron beam from the gun scans the screen at a constant speed, very much like a machine gun that fires a steady stream of bullets, line by line, across a target. In the picture tube, however, small electric charges called electrons are used rather than bullets.

The signal that makes up the picture is fed to the electron gun. The gun then sends out a beam of electrons in accordance with the picture signal. The phosphor dots that are hit by the beam are turned on, and start to glow, while the others do not. It is this process of turning the phosphor dots on and off that makes the picture visible.

The phosphor dots on the screen make up horizontal lines of pixels (picture elements), and the number of pixels determines the resolution of the screen. The Commodore 64 has a resolution of 320 pixels across and 200 pixels down. A horizontal line of pixels is called a raster, and, in the case of the 64, contains 320 pixels. Each raster is scanned from left to right by the electron beam. After a raster has been scanned, the beam starts scanning the next raster line. There are a total of 263 raster lines, of which only 200 (raster lines 50 to 249) are in the visible area of the screen.

The picture on the screen is drawn 60 times each second. This drawing process can be interrupted by what is called a raster interrupt. As the name implies, it interrupts the screen-drawing process for a moment, performs a different operation, and then continues the screen-drawing from where it left off.



Using raster-interrupt routines, you can have 56 sprites on-screen all at once.

The Registers

Raster-interrupt routines always use registers 53265 ($D011), and 53266 ($D012). These registers have two functions. When they are read, they return the current position of the raster beam, and when they are written to, an interrupt occurs if the raster line being scanned is equal to the values in these registers. Since the last visible raster line is line 262, the largest possible value for a raster line is 262. However, a register can hold only a maximum value of 255, which is why two registers (registers 53266 and 53265) are needed to store the raster value. Actually, only the eighth bit of register 53265 is used. Therefore, when setting register 53265, care must be taken not to change any of the other seven bits.

The interrupt that is generated by writing to registers 53266 and 53265 will cause a jump to the address specified in the interrupt vector (location 788($0314) and 789($0315)). The address is stored in low-byte/high-byte format. To calculate high and low byte for an address, divide the address by 256. The quotient is the high byte and the remainder is the low byte. For example, to calculate the high and low byte of address 49152, divide 49152 by 256. You will get a quotient of 192 (high byte) and a remainder of zero (low byte). When changing the interrupt vector, the interrupts must be disabled; otherwise, the system will crash. To disable interrupts, poke register 56333 ($DC0D) with 127. To enable interrupts, poke register 56333 with zero.

Two other important registers are 53274 ($D01A) and 53273 ($D019). Register 53274 tells the computer which of the following four interrupts it should recognize. Each type of interrupt is indicated by a one in the appropriate bit of register 53274, as shown below:

Bit 0	Enable raster compare IRQ
Bit 1	Enable sprite-to-background IRQ
Bit 2	Enable sprite-to-sprite IRQ
Bit 3	Enable light pen IRQ

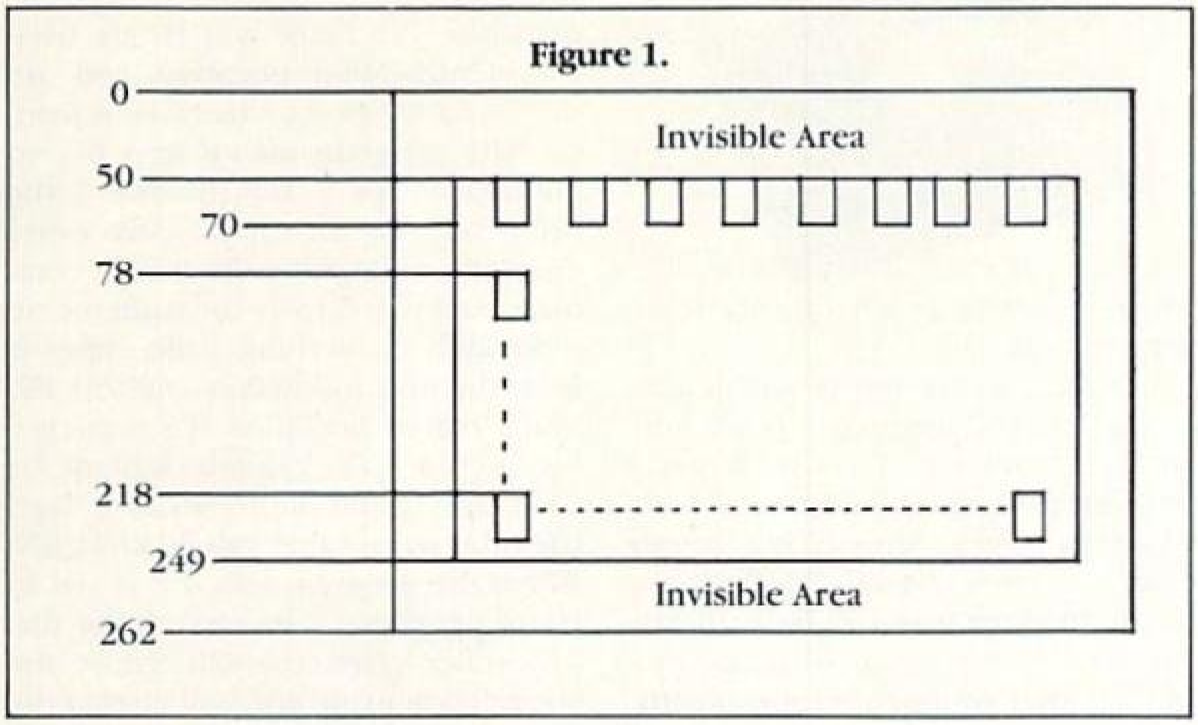
To set an Interrupt Request (IRQ), a one should be put in the bit corresponding to the interrupt desired.

Register 53273 returns the type of interrupt that has occurred. It is set up in the same way as register 53274.

Bit 0	Has raster compare IRQ been set?
Bit 1	Has sprite-to-background IRQ been set?
Bit 2	Has sprite-to-sprite IRQ been set?
Bit 3	Has a light pen IRQ been set?
Bit 7	Has any IRQ been set?

A one in the specified bit means that an interrupt has occurred, a zero means it has not. After this register has been read, a one must be written back to the same bit to clear it. Otherwise the computer will constantly interrupt itself, and will appear to have crashed.

Figure 1.



The Program

To display 56 sprites on the screen, a row of sprites is first set up with the top of each sprite at raster line 50 (see Figure 1). Since the Y coordinates of the sprites have the same values as the raster beam, its value will now be 50. Each subsequent row of sprites is programmed to appear 28 lines below the previous row. This is to ensure that the sprites are uniformly spaced and clearly visible. The second row, therefore, appears on line 78, the third on line 106, and so on, until the seventh and final row appears on raster line 218. You can see that the rows of sprites appear in seven different positions during every screen update (once every 60th of a second). Since the position of the sprites changes so rapidly, the images of the previous sprites do not have enough time to fade out before the screen is redrawn. It is important to understand that the computer can only generate eight sprites at any given time, but, because the image of previous sprites remains on the screen for a fraction of a second, it gives the impression that 56 sprites are being displayed at one time.

Let us see how the above theory can be used in a program to see 56 sprites. Type in the BASIC loader program at the end of this article (Listing 1). The BASIC loader program has two parts: The first part sets up a row of eight sprites on raster line 50, the second part reads the machine-language program, represented as data statements, into memory. The machine-language program handles the interrupts and moves the sprites from row to row.

When you type in Listing 1, be sure to type in the data statements accurately, since they represent the machine-language interrupt program. Save the BASIC program on tape or disk before running it, so if the system does crash because of a typing error in the data statements, the saved program can be reloaded and the typo corrected without having to retype the whole program.

Although the program displays 56 sprites, it is possible to display more. In fact, it is possible to display a row of eight sprites on every raster line. This, however, is not very impressive, because the rows of sprites will overlap each other.

The interrupt function is a very powerful one. You should use it to experiment, and in doing so you will understand how spectacular displays are created for video games. One word of advice: Interrupt programs must be written in machine language because BASIC is too slow to cope with the speed of interrupts. C

Before typing this program, read "How to Enter Programs" and "How to Use the Magazine Entry Program." The BASIC programs in this magazine are available on disk from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007, 1-800-831-2694.

BASIC Loader

```
100 PRINT CHR$(147)CHR$(5);
    "PLEASE WAIT...":POKE 53280,0
    :POKE 53281,0'FARG
110 A=30:V=53248:POKE V+21,255'ESDC
120 FOR T=0 TO 7:POKE 2040+T,13
    :NEXT'GNOD
130 FOR T=0 TO 62:POKE 832+T,255
    :NEXT'GODE
140 FOP T=0 TO 15 STEP 2 :POKE V+T,A'GKUF
150 A=A+32:NEXT'DFEC
160 FOR T=0 TO 98:READ X:Y=Y+X
    :POKE 49152+T,X:NEXT'JUCL
170 IF Y<>12236 THEN PRINT"DATA ERROR"
    :STOP'GHDK
180 PRINT CHR$(147):SYS(49152):END'EOCI
1000 DATA 169,027,141,017,208,169,
     127'BCWX
1010 DATA 141,013,220,169,034,141,
     020'BCRY
1020 DATA 003,169,192,141,021,003,
     169'BCGA
1030 DATA 001,141,026,208,169,050,
     141'BCYB
1040 DATA 018,208,141,254,207,096,
     169'BCXC
1050 DATA 001,141,025,208,173,018,
     208'BCBD
1060 DATA 205,254,207,208,039,024,
     105'BCIE
1070 DATA 028,201,246,208,002,169,
     050'BCFF
1080 DATA 141,018,208,141,254,207,
     141'BCEG
1090 DATA 001,208,141,003,208,141,
     005'BCNH
1100 DATA 208,141,007,208,141,009,
     208'BCFY
1110 DATA 141,011,208,141,013,208,
     141'BCQA
1120 DATA 015,208,173,013,220,041,
     001'BCNB
1130 DATA 240,003,076,049,234,076,
     188'BCVC
1140 DATA 254'BDEY
```

END

BY STEPHEN RODDA

Disk Utility
for the Commodore 64

No Name Disk

Disk housekeeping is probably one of the most tedious tasks in computing. A lot of time is spent renaming, copying, and scratching programs. "Disk Utility" simplifies and speeds up all these housekeeping functions. It is a user friendly, menu driven program, useful not only to the novice but to the experienced programmer, as well.

The Disk Utility program provides ten functions which are accessed from a main menu. When a function is accessed, the name of the function is displayed in the top left corner of the screen in reverse video, so that you always know that function is currently in use.

If at any time after a function is invoked, you decide not to proceed any further, a built-in feature will ask (just after the last bit of data to be input) whether you wish to continue. If you wish to continue, key in Y. Any other key will stop further action within the current function and return you to the main menu.

There are further safeguards for those functions that can cause irreversible damage to the contents of a disk. To call these functions, the shift key must be pressed together with the appropriate function key. For example, when you wish to access the disk formatting function, you must press the shift key and the F2 key at the same time. In addition, help screens are built into the program to explain what each function does. These screens are accessed by pressing the F7 key. Type in Disk Utility and see how easy it is to use. But, to be on the safe side, be sure to save the program before you run it.

Disk Utility Functions

View the Directory: This function displays the directory on the screen, including the disk name and ID, the blocks occupied by a file, file name, file type, and the number of free blocks. To view a directory, press the F1 function key. If you wish to pause while the directory is being listed, press the spacebar. To restart the listing from where it left off, press the spacebar again.

Validate: A disk may be inefficiently used if programs are repeatedly saved and scratched on it. When a program is scratched, the space it occupied becomes available. If a shorter program is now saved in this free area, part of the area may still be available, but may be too small to accommodate another program. Consequently, the space remains unused. The validate function reorganizes the programs on the disk, so that free space for more program storage is made available. As a general guide, the validate function takes up to two minutes to validate a full disk. To validate a disk, press the F3 key. You will be asked if it is OK to continue. Type Y, and the disk in the drive will be validated. Be careful when using this function. If a sequential, relative, or user file was previously written and the file was not closed, validating will erase the file.

Renaming: To rename a file, press the F5 key. The program will ask for the new name and the old name of the file you want to change. Renaming only has to write a few characters on the disk and this takes approximately two seconds.

Instructions: As mentioned before in this article, the utility has built-in help screens. To see the first help screen, press F7. To continue to the next help screen press the spacebar.

Format: Formatting is necessary when using a new disk or erasing an old disk. It creates the directory and the Block Availability Map (BAM). It also puts block and timing markers, a name, and an ID on the disk. Be extra careful when formatting a disk, because formatting erases all information on the disk.

To format a disk press F2. The program will ask for a name and ID. Any name may be used, as long as it is 16 characters or less in length, and any ID that is two characters long is acceptable. The name and ID are used for identification purposes and are displayed when the directory is loaded. The program asks if it is OK to continue. Type Y, and the disk in the drive will be formatted. Any other character will ignore the format command and will display the main menu.

Scratch: Scratching a file erases it from the disk and makes available the space that it occupied. To scratch a file, press F4. The program will ask for the name of the file to scratch. Type the file name and press RETURN. When the program asks if it is OK to continue, press Y to scratch the file. Any other character will ignore the scratch command and will display the main menu. After completing the scratch function, the program will print a FILES SCRATCHED error. The number to the right of the words "files scratched" will indicate how many files were erased.

It is possible to scratch one file at a time or groups of files using "wild cards." For example, if a disk contains programs called "APPLE," "APRICOT," "GAMES,2 and "ALPHABET," enter "A*" (without the quotes) when the program asks for the name of the file to be scratched. All files beginning with "A" will be scratched. All other files, for example GAMES, will be left intact.

Pattern matching can also be used with the scratch function. For example, if the files on a disk are "ABC," "ACC," and "ADC," enter "A?C" (without the quotes) as the file name. All three files will be scratched. The question mark replaces the unknown character, and can be used as many times as required. To fully understand how wild cards and pattern matching work, refer to the 1541 user's manual.

Change Disk Name: This function allows a disk name to be changed without erasing any of the files on the disk. To use this function, press F6. The program will ask for the new name. Type the new name and press RETURN. When the program asks if it is OK to continue, type Y, and the name will be changed. Any other character will abort the function and display the main menu.

Change Disk ID: Changing the disk's ID works in a similar way to changing the disk name, except that here the ID is changed. To change the ID, press F8. The program will now ask for a two-character ID to be entered. Do so and press RETURN. The program will ask if it is OK to continue. Type Y, and the ID of the disk in the drive will be changed. Any other key will abort the "change ID" function, and will display the main menu.

Copy: "Copy" allows any file under 110 blocks in length to be copied from one disk to another. The copy function can copy any BASIC or machine-language program. It can also copy sequential or user files.

To use the copy function, press C at the main menu. The program will ask for the name of the file to copy. Type in the name and press RETURN. The program will then ask for the file type to be entered. The file type is either a P, S, or U (program, sequential, or user). If you are not sure what the file type is, look for it when you load the directory. It will be located to the right of the file name. The file will now be read from the disk in the drive. The program will ask for the destination disk. Insert the disk you want to copy the file on to, and press RETURN. The file will be duplicated on the destination disk.

Exit: Any time you are in the main menu, you can press X to exit the program and return to BASIC. The program will not be erased, so to restart, type RUN. One final note about Disk Utility. If you get a disk error when using one of the functions, it will be displayed on the screen. If everything works properly, the program will display the main menu. ■

Before typing this program, read "How to Enter Programs" and "How to Use the Magazine Entry Program." The BASIC programs in this magazine are available on disk from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007, 1-800-831-2694.

Disk Utility

```
10 OPEN 15,8,15'BHAX
12 GOSUB 304:GOTO 262'CHDB
14 PRINT"[CLEAR]"'BATC
16 OPEN 1,8,0,"$0":GOSUB 28'CJQG
18 SYS 49386:GOSUB 28'CIUH
20 CLOSE 1'BBIX
22 PRINT"[DOWN]PRESS ANY KEY TO
   CONTINUE"'BAOH
24 GET K$:IF K$=""THEN 24'EHDG
26 GOTO 262'BDJF
28 INPUT#15,A$,B$:IF VAL(A$)<>0 THEN
   32:NT"[CLEAR]"A$","B$:GOSUB 184
   :GOTO 262'IGWS
30 RETURN'BAQY
32 PRINT"[CLEAR]"A$","B$:CLOSE 1
   :GOSUB 184:GOTO 262'EOPG
34 PRINT V$"FORMAT[RVOFF]"'BCQG
36 PRINT"[DOWN]ENTER NEW DISK NAME. ";
   :GOSUB 244'CFJM
38 PRINT"[DOWN]ENTER NEW ID. "
   :INPUT I$'CDYM
40 PRINT"[DOWN]THIS WILL ERASE ANY
   PREVIOUS INFORMATION ON THE
   DISK."'BAGP
42 GOSUB 184:IF W THEN W=0 :GOTO 262'FLFH
44 PRINT#15,"N0:"+H$+","+I$
   :GOTO 168'FLYK
46 PRINT V$"SCRATCH[RVOFF]"'BCFJ
48 PRINT"[DOWN]ENTER FILE TO ERASE: ";
   :GOSUB 244'CFSP
50 GOSUB 184:IF W THEN W=0 :GOTO 262'FLFG
52 PRINT#15,"S0:"+H$:GOSUB 168'DJBH
54 PRINT V$"RENAME[RVOFF]"'BCYI
56 PRINT"[DOWN]PLEASE ENTER NEW NAME
   : ";:Y=1:GOSUB 244:Y=0'ELOS
58 PRINT"[DOWN]PLEASE ENTER OLD NAME
   : ";:GOSUB 244'CFYR
60 GOSUB 184:IF W THEN W=0 :GOTO 262'FLFH
62 PRINT#15,"R0:"+J$+"="+H$'EHEI
64 GOTO 168'BDOH
66 PRINT V$"VALADATE[RVOFF]"'BCOL
68 PRINT"[DOWN]VALADATING MAY TAKE UP
   TO TWO MINUTES"'BAOU
70 GOSUB 184:IF W THEN W=0
   :GOTO 262'FLFI
72 PRINT#15,"V":GOTO 168'CHBH
74 PRINT V$"INSTRUCTIONS[RVOFF]"'BCCM
76 PRINT"[DOWN]FORMATTING,
    PREPARES A NEW DISK FOR USE,
   GIVES IT A NAME AND ID,";'BBVB
78 PRINT" AND ERASES ALL"'BAPP
80 PRINT"FILES ON THE DISK."'BAGJ
82 PRINT"[DOWN]SCRATCHING A FILE,
    ERASES THE FILE YOU"'BAOQ
84 PRINT"SPECIFY."'BAAK
86 PRINT"[DOWN]RENAMING A FILE,
    REPLACES THE OLD"'BAHT
88 PRINT"FILENAME WITH THE ONE YOU
   SPECIFY."'BALV
90 PRINT"[DOWN]VALIDATING A DISK,
    REBLOCKS THE FILES"'BAQP
92 PRINT"AND GETS RID OF ";'BBRL
94 PRINT"WASTED SPACE. THIS
   COULDCREATE EXTRA USABLE SPACE ON
   THE DISK."'BADB
96 PRINT"[DOWN]VIEWING A DIRECTORY,
    DISPLAYS THE"'BADU
98 PRINT"DIRECTORY. ";'BBYQ
100 PRINT"YOU MAY PAUSE IT WITH
    THE"'BAEC
102 PRINT"SPACE BAR."'BAXA
104 FOR X=1824 TO 1863:POKE X,99
    :POKE X+54272,2:NEXT'HYKI
106 PRINT"[DOWN3]PRESS ANY KEY TO
    CONTINUE"'BAXI
108 GET K$:IF K$=""THEN 108'EIDH
110 IF P=1 THEN P=0:GOTO 262'FISA
112 PRINT"[CLEAR,DOWN,RVS]PAGE 2
    [RVOFF]"'BALB
114 PRINT"[DOWN]CHANGING THE DISK
    NAME, CHANGES THE"'BARJ
116 PRINT"CURRENT NAME TO ONE
    SPECIFIED."'BAGK
118 PRINT"[DOWN]CHANGING THE DISK ID,
     CHANGES THE"'BARN
120 PRINT"CURRENT ID TO ONE
    SPECIFIED."'BAGF
122 PRINT"[DOWN]CHANGING A DISK NAME
    OR ID WON'T ERASE"'BAEJ
124 PRINT"ANY FILES ON THE DISK."'BARH
126 PRINT"[DOWN]COPYING A FILE,
    COPIES A FILE FROM ONE"'BALN
128 PRINT"DISK TO ANOTHER."'BASJ
130 PRINT"[DOWN]EXIT RETURNS TO
    BASIC"'BAQE
132 FOR X=1 TO 4:PRINT:NEXT'FFJE
134 P=1:GOTO 104'CGNE
136 PRINT V$"CHANGE DISK NAME[RVOFF]
    "'BCEJ
138 PRINT"[DOWN]NEW NAME: ";
    :GOSUB 244'CFKK
140 GOSUB 184:IF W THEN W=0
    :GOTO 262'FLFE
142 IF LEN(H$)<16 THEN H$=H$+CHR$(160)
    :GOTO 142'ITJK
144 FOR X=1 TO 2'DDUF
146 PRINT#15,"I":OPEN 2,8,2,"#"
    :PRINT#15,"U1:"2;0;18;0'DWYM
148 PRINT#15,"B-P:"2;144:PRINT#2,H$;
    :PRINT#15,"U2:"2;0;18;0'DBPP
150 CLOSE 2:NEXT:GOTO 168'DGOC
152 PRINT V$"CHANGE DISK ID[RVOFF]
    "'BCEH
154 INPUT"[DOWN]NEW I.D. (2
    CHARACTERS)";D$'BDBK
156 IF LEN(D$)<>2 THEN 152'FITK
158 GOSUB 184:IF W THEN W=0
    :GOTO 262'FLFN
160 FOR X=1 TO 2'DDUD
162 PRINT#15,"I":OPEN 2,8,2,"#"
    :PRINT#15,"U1:"2;0;18;0'DWYK
164 PRINT#15,"B-P:"2;162:PRINT#2,D$;
    :PRINT#15,"U2:"2;0;18;0
    :CLOSE 2'EDXO
166 NEXT:GOTO 168'CECI
168 INPUT#15,A$,B$,C$,D$'BOBM
170 PRINT"[CLEAR,DOWN]"A$","B$","C$",
    "D$'BITF
172 IF VAL(A$)=0 THEN 178'EIVI
174 PRINT"[DOWN]PRESS ANY KEY TO
    CONTINUE"'BAON
176 GET K$:IF K$=""THEN 176'EIIM
178 PRINT#15,"I"'BDPL
180 IF P=1 THEN P=0:RETURN'FFTH
182 GOTO 262'BDJG
184 PRINT"[DOWN]OK TO CONTINUE
    (Y/N)"'BACM
186 GET Z$:IF Z$=""THEN 186'EION
188 IF Z$="Y"THEN RETURN'ECXO
190 IF Z$<>"Y"THEN W=1:RETURN'GFLJ
192 PRINT V$"COPY[RVOFF]"'BCDI
194 PRINT"[DOWN]ENTER FILE NAME: ";
    :GOSUB 244'CFWO
196 INPUT"ENTER FILE TYPE (P,S,U)";
    T$'BDTR
198 IF T$<>"P"AND T$<>"S"AND
    T$<>"U"THEN 192'KJLV
200 GOSUB 184:IF W THEN W=0
    :GOTO 262'FLFB
202 PRINT"[DOWN]READING ";H$'BDNB
204 POKE 53247,0'BHWB
206 OPEN 1,8,2,"0:"+H$'CINF
208 SYS 49280:CLOSE 1'CHAG
210 GOSUB 228'BDPX
212 IF PEEK(53247)<>0 THEN PRINT"
    [CLEAR,DOWN]FILE TO LARGE TO COPY"
    :GOTO 238'HMZM
213 POKE 53247,PEEK(782)'CLXD
214 PRINT"[CLEAR,DOWN]INSERT
    DESTINATION DISK AND PRESS
    RETURN"'BAFN
216 GET K$:IF K$=""THEN 216'EIDH
218 PRINT"[DOWN]WRITING ";H$'BDFI
220 OPEN 1,8,3,H$+","+T$+",W"'EKHD
222 GOSUB 228'BDPB
224 SYS 49328:CLOSE 1'CHDE
226 GOTO 262'BDJF
228 INPUT#15,A$,B$,C$,D$'BOBJ
230 IF VAL(A$)>0 THEN 234'EIND
232 RETURN'BAQB
234 CLOSE 1:PRINT"[CLEAR,DOWN]"A$",
    "B$","C$","D$:GOSUB 184
    :IF W THEN W=0:GOTO 262'HWNN
236 GOTO 262'BDJG
238 PRINT"[DOWN]PRESS ANY KEY TO
    RETURN TO MAIN MENU"'BAHR
240 GET K$:IF K$=""THEN 240'EIAE
242 GOTO 262'BDJD
244 G$="":H$="":IF Y=1 THEN J$=""'GKKK
246 GET G$:IF G$=""THEN 246'EIXK
248 IF G$=CHR$(13)AND H$<>""THEN PRINT
    :RETURN'JJUP
250 IF G$=CHR$(20)THEN 260'EJVF
252 H$=H$+G$:PRINT G$;'DKYH
254 IF LEN(H$)>16 THEN H$=LEFT$(H$,
    16)'GPAM
256 IF Y=1 THEN J$=J$+G$'FIRM
258 GOTO 246'BDLK
260 LN=LEN(H$):FOR X=1 TO LN
    :PRINT CHR$(20);:NEXT
    :GOTO 244'JWKM
262 PRINT"[CLEAR]":POKE 53280,6
    :POKE 53281,6'DQBJ
264 V$="[CLEAR,DOWN,RVS]"'BCBH
266 PRINT SPC(4)"[WHITE]DISK UTILITY.
    [SPACE2]BY[SPACE2]STEPHEN
    RODDA"'CCKS
268 FOR V=1104 TO 1143:POKE V,99
    :POKE V+54272,2:NEXT'HYLT
270 FOR X=1 TO 4:PRINT:NEXT'FFJH
272 PRINT" [RVS]F1[RVOFF]
     VIEW DIRECTORY"SPC(3)"[RVS]F2
    [RVOFF] FORMAT A DISK"'CCMQ
274 PRINT" [DOWN,RVS]F3[RVOFF]
     VALIDATE A DISK"SPC(2)"[RVS]F4
    [RVOFF] SCRATCH FILE(S)"'CCWT
276 PRINT"[DOWN] [RVS]F5[RVOFF]
     RENAME A FILE"SPC(4)"[RVS]F6
    [RVOFF] CHANGE DISK NAME"'CCUU
277 PRINT" [RVS]F7[RVOFF]
     INSTRUCTIONS"SPC(5)"[RVS]F8
    [RVOFF] CHANGE DISK ID"'CCBV
278 PRINT" [DOWN3,RVS]C [RVOFF]
     COPY A FILE"SPC(6)"[RVS]X [RVOFF]
     EXIT PROGRAM"'CCKV
279 FOR X=1824 TO 1863:POKE X,99
     :POKE X+54272,2:NEXT'HYKV
```

```
280 PRINT SPC(4)"[DOWN5]
    SELECT ONE OF THE ABOVE
    FUNCTIONS"'CCJO
282 GET K$:IF K$=CHR$(133)THEN 14'FMBL
284 IF K$=CHR$(134)THEN 66'EJKM
286 IF K$=CHR$(135)THEN 54'EJIO
288 IF K$=CHR$(136)THEN 74'EJLQ
290 IF K$=CHR$(137)THEN 34'EJIJ
292 IF K$=CHR$(138)THEN 46'EJML
294 IF K$=CHR$(139)THEN 136'EKLN
296 IF K$=CHR$(140)THEN 152'EKBP
298 IF K$=CHR$(88)THEN PRINT"[CLEAR]"
    :CLOSE 15:END'HKCU
300 IF K$=CHR$(67)THEN 192'EJPB
302 GOTO 282'BDLA
304 FOR T=0 TO 45:READ D:Q=Q+D
    :POKE 49280+T,D:NEXT
    :IF Q<>7499 THEN 344'NEXP
306 DATA 169,0,133,251,169,48,133,252,
    162,1,32,198,255,160,0,32,207,
    255'BMTP
308 DATA 166,144,208,18,145,251,200,
    208'BFCL
310 DATA 244,230,252,165,252,201,160,
    208,234,169'BOJG
312 DATA 1,141,255,207,145,251,32,204,
    255,96'BKQH
314 FOR T=0 TO 48:READ D
    :POKE 49328+T,D:R=R+D:NEXT
    :IF R<>8035 THEN 344'NETQ
316 DATA 169,0,133,253,169,48,133,254,
    160,0,162,1,32,201,255,177,253,
    32'BMMQ
318 DATA 210,255,166,144,208,21,204,
    255'BFYM
320 DATA 207,240,10,200,192,0,208,237,
    230,254,76,191,192,165,252,197,
    254'BNVL
322 DATA 208,240,32,204,255,96'BVXF
324 FOR T=0 TO 87:READ D
    :POKE T+49386,D:K=K+D:NEXT
    :IF K<>13101 THEN 344'NFSR
326 DATA 162,1,32,198,255,32,207,255,
    32'BFDL
328 DATA 207,255,32,207,255,165,144,
    208,66,32,207,255,240,61,32,204,
    255'BMWT
330 DATA 32,228,255,201,32,208,5,32,
    228'BFVG
332 DATA 255,240,251,162,1,32,198,255,
    32,207,255,141,0,206,32,207,255,
    168'BOOO
334 DATA 174,0,206,152,32,205,189,
    169'BDPJ
336 DATA 32,32,210,255,32,207,255,240,
    6'BFPM
338 DATA 32,210,255,76,43,193,169,13,
    32'BFFO
340 DATA 210,255,76,245,192,32,204,
    255,96'BHMH
342 RETURN'BAQD
344 PRINT"[CLEAR]ERROR IN DATA
    STATEMENTS"'BADM
```

END

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JOHN J. KOTTLER

128 Character Editor

The Commodore 128 personal computer has one of the strongest BASIC languages ever developed for a home computer system. Using its tremendous vocabulary of graphics commands, a programmer can draw almost anything. If, for instance, you want to create graphics in an arcade game, sprites are excellent to use as moving objects, and bit-mapped graphics are suitable for backgrounds. But what if you want to scroll the scenery? You cannot scroll a bit-map screen—but you can redesign custom characters that will scroll. Custom characters are also useful for creating different character fonts and for "mass-movement." But how do you use custom characters on the 128?

Missing Commands

The Commodore 64 is capable of redefining characters by using a series of pokes and data statements. The 128 uses a similiar method, but instead of the clumsy POKE 1 command that is often associated with custom characters, you can merely select bank 14 and be able to read the character ROM. Once you copy the ROM to a RAM location by using a typical FOR-NEXT loop or by using the transfer command in the machine-language monitor, you can reconstruct the way each character is printed on the screen. This task is accomplished by poking values into your RAM character area. Since data statements were often cumbersome, programmers began to design character editors.

The 128 Character Editor

Being artistic takes skill, and most people would rather draw each character directly on the screen rather than on paper using a bunch of data numbers. The 128 character editor program at the end of this article will allow you to do just that. With this program, you can select any existing character, modify it until you are satisfied, and save your new character set as a file on disk.

Once you have entered and saved the 128 character editor program, you can start to experiment with the wonderful world of custom characters without ever having to see a data statement! When you run the program, a high-resolution portion of the screen will be drawn and then you will be asked if you would like to edit the upper-case character set or the lower-case character set. Once you have answered this prompt, the screen will blank for approximately ten seconds. During this time, the character set you have chosen will be copied to a memory location in RAM. Once this has been completed, your screen will display the entire character set. Soon after this, a cursor will appear on top of the "@" symbol. The computer is now in the "Select Character" mode.

Once you have entered and saved this program, you can experiment with the wonderful world of custom characters without ever having to see a data statement.

To select a character to edit, use the cursor keys to move around the character set. Once the cursor is flashing on the character you wish to change, you can press the RETURN key to edit the character. The character you selected should appear in the small white box at the top of the screen and the grid to the left should start to fill accordingly. Once the grid is completed, a light blue cursor will appear in the upper left-hand corner of the grid. Now you can use the cursor keys to move within the grid.

If you wish to clear the grid and the character, press SHIFT and the CLR/HOME key together. However, if you would like to move the cursor to the upper left-hand corner, press the CLR/HOME key by itself. In order to turn on certain dots in the grid, you can press the space bar. If you decide to turn off a dot, the INST/DEL key by itself will erase it. While you are changing the character dots, the small white box will display what the character will actually look like. When you feel that the character is perfect, press the RETURN key. You will be asked if you would like to place the current character you are working on into the character set at the bottom of the screen. If you do not wish to use the newly designed character, press the "N" key and you will return to the "Select Character" mode.

While you are selecting a character to change in the "Select Character" mode, you can press other keys to accomplish other tasks. The left arrow key above the CONTROL key will allow you to restart the 128 character editor program. If you are finished and wish to quit the program, press the ESC key. Holding down the "B" key will allow you to cycle through the background colors, and the HOME key will move the cursor to the "@" symbol.

When designing characters for a game, you may like to see just how the characters will fit together. By pressing the "T" key, a small window will be displayed at the very bottom of the screen where you can type up to three lines of text characters. You can use all of the CONTROL color codes and even clear the window with the CLR/HOME key. Once you have finished typing, press the RETURN key to return to the character selection mode. The 128 character editor also allows you to copy a character to another character by using the "C" key. Once you have pressed this key, you will be asked to select the character to copy and then the character you wish to replace. Of course, when you are finished with your character set, you can press the "S" key and enter a file name to save your work. If you wish to recall it, simply press the "L" key and enter the appropriate file name.

Using Your New Set with Your Programs

After you have saved your character set on disk, you can insert the following line in your own programs, in order to use the new characters:

BLOAD " filename ",B0,P 12288

This command will load the character set into a memory area starting at location 12288. Some programmers may notice that this will interfere with any bit-mapped graphics data. However, it is possible to combine bit-mapped graphics with a text window and a custom character set. You simply must plan the memory locations so they will not interfere. It is important to note that you can easily change where you would like the character set to be. Just change the 12288 to another memory location and the character set will load there instead. But many of the rules of the Commodore 64 still exist. For example, keep the character set within the same memory locations you would on the 64—between 8192 and 14336.

Once your character set has loaded, you can use the following pokes to display it:

Memory Locations	POKE Values
8192 - 10239	POKE 2604, 24
10240 - 12287	POKE 2604, 26
12288 - 14335	POKE 2604, 28

Location 2604 is similar to location 53272 on the Commodore 64. All you need to do is poke this one number. Don't worry about BASIC overwriting your characters; there is no need to change the start of BASIC like you had to on the Commodore 64. Of course, you can still load character sets that you have already designed as well.

It should also be mentioned that this program uses the system reset vector after you press the ESC key and confirm it by pressing "Y." You should write down this system number. It could be very handy in the future.

The Commodore 128 is very flexible and can handle many forms of graphics. I hope you will use the Commodore 128 character editor often to explore custom characters and use them often in your programs. ■

Before typing this program, read "How to Enter Programs." The BASIC programs in this magazine are available on disk from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007, 1-800-831-2694.

Commodore 128 Character Editor

```
50 PRINT"[HOME2,CLEAR,UNLOCK]";
   CHR$(142):DIM CD(2048),PD(75)
   :POKE 2604,21:SPRITE 1,0
60 FAST:GRAPHIC 1,1:BOX 1,89,90,99,
   100,0,1
70 SSHAPE D$,89,90,+11,+21:SPRSAV D$,1
   :SLOW
80 COLOR 0,12:GRAPHIC 2,1,13
   :COLOR 4,13:COLOR 1,13
   :CHAR 1,0,0,"[SPACE10]
   128 CHARACTER EDITOR[SPACE10]",1
90 COLOR 1,2:FOR X=0 TO 80 STEP 10
   :DRAW 1,X,10 TO X,90:NEXT
   :FOR Y=10 TO 90 STEP 10
   :DRAW 1,0,Y TO 80,Y:NEXT
100 COLOR 1,14:CHAR 1,11,2,
    "CURRENT CHARACTER:":COLOR 1,2
    :CHAR 1,29,1,"[CMDR A,SHFT *,
    CMDR S]":CHAR 1,29,2,"[SHFT -]
    [SHFT -]":CHAR 1,29,3,"[CMDR Z,
    SHFT *,CMDR X]"
110 COLOR 1,8:CHAR 1,11,4,"CRSR,
    [SPACE3]AND[SPACE3]
    TO MOVE UP/DOWN":X=17:Y=4
    :GOSUB 210:X=23:Y=4:GOSUB 220:X=17
    :Y=5:GOSUB 230:X=19:GOSUB 240
120 CHAR 1,21,5,"TO MOVE LEFT/RIGHT"
130 COLOR 1,11:CHAR 1,11,7,
    "SPACE - DRAW[SPACE4]DEL - ERASE"
    :CHAR 1,11,8,"SHIFT CLR/HOME -
    CLEAR":CHAR 1,11,9,"S-SAVE[SPACE3]
    L-LOAD[SPACE3]C-COPY"
140 CHAR 1,11,10,"T-TEXT[SPACE3]
    B-BACKGROUND COLOR"
150 COLOR 1,12:DRAW 1,0,103 TO 320,103
160 PRINT"[HOME,DOWN13,WHITE,RVS,TAB,
    RIGHT2]U[RVOFF]PPER OR [RVS]L
    [RVOFF]OWER CASE?"
170 GET KEY U$:IF U$="L"THEN PRINT
    CHR$(14):RM=53248+2048
    :ELSE PRINT CHR$(142):RM=53248
180 REM ** COPY CHARACTER ROM TO RAM
    **
190 FAST:BANK 14:FOR A=RM TO RM+2047
    :POKE 12288+A-RM,PEEK(A):NEXT
    :BANK 15:SLOW:COLOR 0,1:COLOR 1,2
    :BK=1:GOTO 250
200 REM ** 150 - 180 DRAW ARROWS **
210 DRAW 1,X*8+4,Y*8+6 TO X*8+4,Y*8
    :DRAW 1,X*8+4,Y*8 TO X*8+8,Y*8+2
    :DRAW 1,X*8+4,Y*8 TO X*8,Y*8+2
    :RETURN
220 DRAW 1,X*8+4,Y*8+6 TO X*8+4,Y*8
    :DRAW 1,X*8+4,Y*8+6 TO X*8+8,Y*8+4
    :DRAW 1,X*8+4,Y*8+6 TO X*8,Y*8+4
    :RETURN
230 DRAW 1,X*8,Y*8+3 TO X*8+8,Y*8+3
    :DRAW 1,X*8,Y*8+3 TO X*8+2,Y*8+1
    :DRAW 1,X*8,Y*8+3 TO X*8+2,Y*8+5
    :RETURN
240 DRAW 1,X*8,Y*8+3 TO X*8+8,Y*8+3
    :DRAW 1,X*8+8,Y*8+3 TO X*8+6,Y*8+1
    :DRAW 1,X*8+8,Y*8+3 TO X*8+6,Y*8+5
    :RETURN
250 PRINT"[HOME,DOWN13,SPACE39]":A=0
    :FOR Y=1 TO 8:FOR X=4 TO 35
    :POKE 1024+480+Y*40+X,A
    :POKE 55296+480+Y*40+X,1:A=A+1
    :NEXT X,Y
260 X=4:Y=1:WINDOW 0,22,39,24,1
    :POKE 2604,28
270 L=1504+Y*40+X:CH=PEEK(L)
    :IF CH>127 THEN POKE L,CH-128
    :ELSE POKE L,CH+128
    :IF TR=0 THEN PRINT"[CLEAR]"
280 GET K$
290 IF K$="[RIGHT]"OR PEEK(212)=86
    THEN X=X+1
300 IF K$="[LEFT]"OR PEEK(212)=85
    THEN X=X-1
310 IF K$="[DOWN]"OR PEEK(212)=84
    THEN Y=Y+1
320 IF K$="[UP]"OR PEEK(212)=83 THEN
    Y=Y-1
```

```
330 IF X<4 THEN X=4:ELSE IF Y<1 THEN
    Y=1
340 IF X>35 THEN X=35:ELSE IF Y>8
    THEN Y=8
350 POKE L,CH:IF TR=1 THEN RETURN
    :ELSE IF K$=CHR$(13)THEN 530
360 IF K$="T"THEN 480:ELSE IF K$="
    [HOME]"THEN X=4:Y=1
370 IF K$="B"AND BK=16 THEN BK=1
    :ELSE IF K$="B"THEN BK=BK+1
380 COLOR 0,BK
390 IF K$="[BACK ARROW]"THEN PRINT"
    [CLEAR,TAB2]RESTART?":GET KEY RI$
    :IF RI$="Y"THEN RUN
400 IF K$="C"THEN 790
410 IF K$="L"THEN DQ=1:GOTO 870
420 IF K$="S"THEN DQ=2:GOTO 870
430 IF PEEK(212)=72 THEN PRINT"[CLEAR,
    TAB,SPACE6]QUIT PROGRAM?"
    :GET KEY QP$:IF QP$="Y"THEN SYS
    65341:ELSE IF PEEK(212)=72 THEN
    430
440 GOTO 270
450 REM *************
460 REM * TEXT MODE *
470 REM *************
480 OPEN 9,0,0:INPUT#9,JN$:CLOSE 9
490 PRINT"[CLEAR]":GOTO 270
500 REM *************
510 REM * GRID MODE *
520 REM *************
530 A=0:COLOR 1,2:FOR YY=0 TO 7
    :POKE 8192+880+YY,PEEK
    (12288+CH*8+YY):NEXT:FOR YY=0 TO 7
    :FOR XX=0 TO 7:LOCATE 240+XX,16+YY
    :PD(A)=RDOT(2):A=A+1:NEXT XX,YY
    :A=0:COLOR 0,12
540 FOR YY=10 TO 80 STEP 10
    :FOR XX=0 TO 70 STEP 10
    :IF PD(A)=1 THEN BOX 1,XX,YY,
    XX+10,YY+10,0,1:ELSE BOX 0,XX+1,
    YY+1,XX+9,YY+9,0,1
550 A=A+1:NEXT XX,YY
560 SX=24:SY=60:SPRITE 1,1,15,0:A=0
570 MOVSPR 1,SX,SY:IF RSPRITE(1,
    0)=0 THEN SPRITE 1,1
    :ELSE IF RSPRITE(1,
    0)=1 THEN SPRITE 1,0
580 GET K$:IF K$="[CLEAR]"THEN BOX 0,
    1,11,79,89,0,1:FOR BX=0 TO 80
    STEP 10:DRAW 1,BX,10 TO BX,90:NEXT
    :FOR BY=10 TO 90 STEP 10
    :DRAW 1,0,BY TO 80,BY:NEXT
    :GOSUB 750
590 IF K$="[RIGHT]"OR PEEK(212)=86
    THEN SX=SX+10:A=A+1
600 IF K$="[LEFT]"OR PEEK(212)=85
    THEN SX=SX-10:A=A-1
610 IF K$="[DOWN]"OR PEEK(212)=84
    THEN SY=SY+10:A=A+8
620 IF K$="[UP]"OR PEEK(212)=83 THEN
    SY=SY-10:A=A-8
630 IF SX<24 THEN SX=24:A=A+1
    :ELSE IF SY<60 THEN SY=60:A=A+8
640 IF SX>94 THEN SX=94:A=A-1
    :ELSE IF SY>130 THEN SY=130:A=A-8
650 IF K$="[HOME]"THEN SX=24:SY=60:A=0
660 IF A<0 THEN A=0:ELSE IF A>63 THEN
    A=63
670 IF K$=CHR$(20)THEN BOX 0,SX-23,
    SY-49,SX-15,SY-41,0,1:DC=0
    :GOTO 700
680 IF K$=" "THEN BOX 1,SX-24,SY-50,
    SX-14,SY-40,0,1:DC=1:GOTO 700
690 GOTO 710
700 DY=INT(A/8):DX=A-DY*8
    :DRAW DC,240+DX,16+DY
710 IF K$=CHR$(13)THEN 730
720 GOTO 570
730 FOR BP=9072 TO 9079
    :BV(BP-9072)=PEEK(BP):NEXT
    :PRINT"[CLEAR,TAB]REPLACE THIS
    CHARACTER?":GET KEY RC$
    :IF RC$="N"THEN 270
740 RC=CH:FOR RD=0 TO 7
    :POKE 12288+CH*8+RD,BV(RD):NEXT
    :GOTO 270
750 FOR ED=9072 TO 9079:POKE ED,0:NEXT
    :RETURN
760 REM *****************
770 REM * COPY CHARACTER *
780 REM *****************
790 PRINT"[CLEAR,TAB]SELECT CHARACTER
    TO COPY.":TR=1
800 IF K$=CHR$(13)THEN 810
    :ELSE GOSUB 270:GOTO 800
810 CC=CH:PRINT"[CLEAR,TAB]
    COPY TO WHAT CHARACTER?":K$=""
    :TR=1
820 IF K$=CHR$(13)THEN 830
    :ELSE GOSUB 270:GOTO 820
830 FOR C1=0 TO 7:POKE 12288+CH*8+C1,
    PEEK(12288+CC*8+C1):NEXT:TR=0
    :PRINT"[CLEAR]":GOTO 270
840 REM **************************
850 REM * LOAD/SAVE CHARACTER SET *
860 REM **************************
870 POKE 2604,21:IF DQ=1 THEN PRINT"
    [CLEAR]* * * LOAD ";
    :ELSE PRINT"[CLEAR]* * * SAVE ";
880 PRINT"CHARACTER SET * * *"
    :PRINT"FILENAME:":WINDOW 9,23,25,
    23:OPEN 9,0,0:INPUT#9,FL$:CLOSE 9
    :PRINT"[HOME2]":WINDOW 0,22,39,24,
    1
890 IF FL$=""THEN 940:ELSE FAST
900 IF DQ=1 THEN CK$=FL$:ELSE CK$="$"
910 OPEN 2,8,2,CK$:CLOSE 2
    :IF DS<>0 THEN SLOW:GOTO 950
920 IF DQ=1 THEN BLOAD (FL$),B0,P12288
930 IF DQ=2 THEN BSAVE (FL$),B0,
    P12288 TO P14336
940 SLOW:POKE 2604,28:GOTO 260
950 PRINT"[CLEAR,BELL]* * * DISK
    ERROR * * *":PRINT DS$:GET KEY DE$
    :GOTO 260
```

END

PROGRAMMERS' TIPS

BY STEPHEN S. LEVEN

RETURN Stripper

for the Commodore 64 and 128

With the world of telecommunications opening up, more and more of us are logging onto bulletin board systems and data bases in an effort to use this abundance of useful information. It is possible, among other things, to bring airline schedules, medical reports, stock quotes, and even passages right out of encyclopedias over the phone lines and into our disk drives and printers.

But what happens when we are preparing a report, either for work or for school, on our trusty word processor and we want to include some downloaded text? Or, when we got mad at the boss and fired off a resume into the company computer, and now want to download it, revise it, and print it using our own equipment?

All the articles and reports on both telecommunications and word processing tell us that this is not only possible, but it happens every day. But there is a subtle problem lurking in the background that puzzles many people who try to accomplish this task. The problem is that the downloaded text files are usually not in quite the right form to be properly handled by our word processors.

Processing Words

When writing with a word processor, you usually use the RETURN key only when you definitely want a carriage return during printing, such as at the end of a paragraph or after each line of a table. However, when a paragraph is being downloaded via modem, a carriage return is sent at the end of *every line of text*. This causes the next character to be printed at the beginning of the next line on the screen, as well as on the printer. The database service or bulletin board sends these carriage returns so you'll be able to easily read the message. In fact, many services format the text specifically for the Commodore 64's 40-column screen. This means that your newly downloaded text file is filled with carriage returns throughout the text, not just at the ends of paragraphs.

Trouble in Paradise

When you load this downloaded text into your word processor, the extra carriage returns prohibit the word processor from making effective use of the formatting commands you give it. For example, if you set up your report to print with a left margin at column 5 and a right margin at column 75, you get a 70-column report. But the section you downloaded has a return after every 40 or less charaters. Those lines will be much shorter—no more than 40 columns wide!

If you have just a short section of downloaded material to include, you can, of course, move the cursor through the text, deleting all unnecessary carriage returns and closing up the spacing. But being basically lazy, and usually having large downloaded files to work with, I decided to let the computer do the work for me.

The Solution

"RETURN Stripper," the program I wrote to bridge the gap between downloaded text files and the word processor, is listed at the end of this article. It's a not-so-simple program that implements a simple idea: Strip all carriage returns out of my downloaded file except at the ends of paragraphs.

Since most text files are single spaced, with double spacing between paragraphs, I used this criterion to determine the end of a paragraph. Thus, when we see a single return, we assume that it was put there by the computer from which the text was downloaded. When we see two returns in a row, we assume that the author intended a paragraph break.

RETURN Stripper reads the downloaded file from disk, character by character. It then writes, unchanged, all characters (except RETURNS) to another file on the disk. When the Stripper encounters a carriage return, it looks to see if the next character is also a RETURN. If so, it outputs them both. If the RETURN is all by itself, the Stripper makes sure there is a space between the last character and the next one. If there is one already, it deletes the carriage return and leaves the space. If the RETURN was the only character in between, the Stripper replaces the RETURN with a space.

How to Strip

It may sound complicated, but it's simple to use. I wrote the RETURN Stripper to be as foolproof, complete, and informative as possible. Type the program and save it to disk. When you want to use it, just load and run it. A short description of the program appears on the screen.

Insert the disk containing the downloaded file into the drive. Make sure there is enough room on the disk for another file of the same size as the downloaded file. The file name to enter when prompted for the input file is the file that was *downloaded*. Pick a new file name for the output file.

Just in case you wanted it, I included the option to get a printout of the file at the same time it's being stripped of carriage returns. This printout is formatted exactly the way the original file was downloaded. That means if the original was formatted for display on a 40-column screen, you'll get a 40-column printout. If you want to reformat the text, you'll have to wait until we're through stripping. Then you can use your word processor.

When the program starts working on your file, the output is sent not only to the disk output file you selected, but also to the screen, so you can see what kind of progress is being made. (If you chose printer output, you would also get a printout.) If you wish to abort the program for any reason, just press the F7 key. The program will stop and all files will be properly closed.

When the Stripper has finished its work, the output file will be suitable for access by your word processor, as long as your word processor operates on sequential files. If not, you'll have to run the output file through a converter to make it acceptable. Now your word processor can also format this portion of your text correctly.

> *No, this isn't a new command that produces an animated sequence starring Gypsy Rose Lee right on your monitor screen! It will, however, help you make the transition from a downloaded text file to one that can be modified and used by your word processor.*

One Pitfall

Since the Stripper deletes solitary carriage returns, it will mess up the formatting of a single-spaced address, table, or poem. A three-line address, for example, has a single carriage return at the end of each line, and these will be replaced with spaces. Similarly, a table or poem will have an intentional author's return at the end of each line. Unfortunately, the Stripper will strip these text areas as well.

For a short table or address, I usually just manually add carriage returns once the text is in my word processor. For large tables, however, there's another trick you can use. First, load the original downloaded text (with carriage returns) into your word processor. Delete everything except the single-spaced table that you want to include. Now save the table in a file on disk. Clear your word processor, and load in the "stripped" file. Find the table, and delete it. Now, load the table you saved from the original, unstripped file into the middle of your text in the word processor. (Since most word processors are different, you'll need to study the instructions to find the exact technique of inserting text in the middle of a file.)

While RETURN Stripper doesn't come in a plain brown wrapper, isn't as sexy as some of the commercial programs on the market, and won't bring back Gypsy Rose Lee, it does do some of the dirty work when it comes to making downloaded files compatible with our word processors. ■

Before typing this program, read "How to Enter Programs" and "How to Use the Magazine Entry Program." The BASIC programs in this magazine are available on disk from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007, 1-800-831-2694.

RETURN Stripper

```
60 PRINT CHR$(147)SPC(12)CHR$(17)
   "RETURN STRIPPER"'EMIL
65 PRINT CHR$(17)SPC(7)"([SHFT C]
   ) 1985 STEPHEN S. LEVEN"'DGBQ
70 PRINT CHR$(14)CHR$(17)"[SHFT T]
   HIS PROGRAM REMOVES EXTRA [RETURN]
   'S"'DIOR
80 PRINT"FROM DOWNLOADED SEQUENTIAL
   FILES FOR"'BAMO
90 PRINT"FURTHER PROCESSING BY
   EASYSCRIPT OR"'BABP
100 PRINT"OTHER WORD PROCESSORS."'BAKB
110 PRINT CHR$(17)"[SHFT E]
    NTER THE FILENAME OF THE INPUT
    (DOWN-"'CEVI
115 PRINT"LOADED) AND THE OUTPUT
    FILES.";'BBHJ
120 PRINT"[SPACE2,SHFT T]HE"'BAKY
130 PRINT"OUTPUT MAY ALSO BE DIRECTED
    TO THE"'BACH
140 PRINT"PRINTER IN THE DOWNLOADED
    FORMAT."'BATI
150 OPEN 15,8,15'BHAB
160 INPUT"[DOWN]INPUT FILE NAME
    [SPACE3,LEFT3]";N$'BDEI
170 OPEN 4,8,4,N$+",S,R"
    :INPUT#15,A,B$,C,D'DUAI
175 IF A THEN PRINT A;B$;C;D:CLOSE 4
    :GOTO 160'FPHN
180 INPUT"[DOWN]OUTPUT FILE NAME
    [SPACE3,LEFT3]";N$'BDCK
190 OPEN 5,8,5,N$+",S,W"
    :INPUT#15,A,B$,C,D'DUHK
195 IF A THEN PRINT A;B$;C;D:CLOSE 5
    :GOTO 180'FPKP
200 INPUT"[DOWN]OUTPUT TO PRINTER,
     TOO?[SPACE2]Y/N[SPACE3]N[LEFT3]";
    P$:P$=LEFT$(P$,1)'DMKK
210 IF P$<>"Y"AND P$<>"N"GOTO 200'HHXD
220 IF P$="Y"THEN CLOSE 6
    :OPEN 6,4,7'FJOD
230 PRINT CHR$(17)CHR$(18)"[SHFT P]
    RESS [SHFT F]7 KEY TO
    ABORT."CHR$(146)CHR$(17)CHR$(17)
    'GVBO
240 B=0'BCKB
250 GET#4,A$:S=ST:X$=RIGHT$(X$,
    2)+A$'FURI
260 GET L$:IF L$=CHR$(136)GOTO
    340'FNBH
270 IF P$="Y"THEN PRINT#6,A$;'EHAH
280 IF B=1 AND LEFT$(X$,
    1)<>" "THEN PRINT#5," ";
    :PRINT" ";'JNDM
290 IF A$<>CHR$(13)THEN PRINT#5,A$;
    :PRINT A$;:B=0:GOTO 330'JWHP
300 B=B+1:IF B=2 THEN PRINT#5,A$A$;
    :PRINT A$A$;:GOTO 330'IXJG
310 IF B=1 THEN 330'DFLA
320 PRINT#5,A$;:PRINT A$;'CJMC
330 IF S=0 THEN 250'DFDC
340 IF P$="Y"THEN PRINT#6:CLOSE 6'FFSF
350 CLOSE 4:PRINT#5:CLOSE 5:CLOSE 15
    :END'FJCG
```

END

BY STEPHEN S. LEVEN

Reset Switches: Renewing Your BASIC Programs

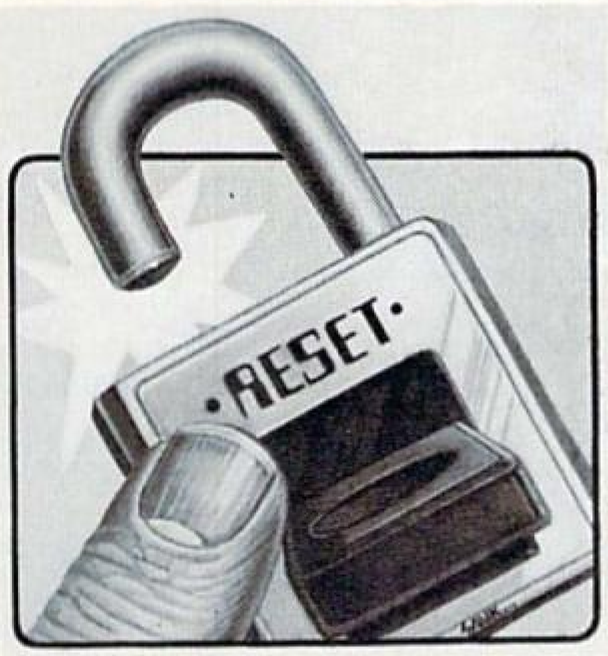
Installing a reset switch in your Commodore computer can give you access to a number of handy features. For instance, a reset switch lets you restart cartridge programs or reboot your computer without exercising the ON/OFF switch. However, one of the best features of a reset switch is that it lets you recover from a lock-up without losing your BASIC program. So, if you do any amount of programming, a reset switch, properly used, can be a real lifesaver.

Computer Lock-up

What is computer lock-up? No, it's not when your spouse locks your computer in the basement so you'll pay him/her some attention. Computer lock-up is any situation in which you cannot regain control of the computer, and the computer is not doing anything "useful." Usually, lock-up occurs when the computer is performing an endless machine-language loop from which there is no escape.

There are several ways to lock up your computer. If you SYS to an incorrect memory location, there is a good chance that the particular combination of machine-language instructions at that location will tell the microprocessor to perform some function over and over, without allowing it to poll the keyboard. This means that any keys you press are ignored. Even the RUN/STOP-RESTORE combination will not work.

This can also occur if you type in a program which includes a machine-language loader. Such programs can usually be identified by a large number of data statements which contain a series of numbers. If you mistype even one of the numbers and run the program, it is possible that your computer will lock up. (That is why the instructions for such programs always insist that you save the program before running it.) Again, your computer is locked in an endless machine-language loop, with no way for you to tell it to stop. If you've saved the program, you can always switch the computer off and on, reload the program, correct it, resave it, and try to run it again.



If your Commodore 64 locks up and you have installed a reset switch, you can recover the BASIC program that was in memory at the time of the lock-up by using this program.

Particularly frustrating is the Commodore 64 "bottom of the screen" bug, a feature found on 64's with the original ROM. As you know, a program line in Commodore BASIC can be up to 80 characters long, which is two screen lines. Often, we programmers begin typing a program line and look up at the monitor later to discover that we've extended onto the third screen line. We know that anything beyond the 80th character will be ignored by the system, so we DELETE back to a suitable stopping point on the second screen line.

Here's the bug: If this occurs at the bottom of the 64 screen, when the cursor deletes back from the third screen line onto the second screen line, things go crazy. The program in BASIC memory begins to run, then stops, and the computer is locked up. There is almost nothing you can do short of turning off the power switch, which will also destroy the program in memory. Murphy's Laws state that this lock-up will only happen just *before* you were going to save the last half-hour's work on your program!

I said "almost" above, because, if you have a datassette, the following sequence of keystrokes will allow you to regain control of the computer, but only if you were bitten by the "bottom of the screen" bug: Press the 9 and N keys at the same time. Then press the PLAY button on the datassette. When the screen goes blank, press the RUN/STOP key. Don't ask why it works. Just be thankful that it does!

Reset to the Rescue

If your Commodore 64 locks up and you are fortunate enough to have installed a reset switch, you can recover the BASIC program that was in memory at the time of the lock-up. Here's how:

When you turn the power switch off, then turn it on, your computer initializes itself. However, the contents of RAM, where your BASIC program is stored, are lost when the power is off, and when the computer is turned on, RAM contains "garbage." However, when you press the reset switch, although your computer performs the same initialization, RAM is neither cleared nor changed. Since the power was never shut off, RAM contains the same data it did before. This means that your BASIC program is still there!

After pressing the reset switch, when your 64's opening screen appears, if you type LIST, you simply get the READY prompt. If you type RUN, you simply get the READY prompt. It sure looks like your program is gone from memory. But that's not the case at all. The program is still there. The computer's operating system doesn't know it, though. The system initialization changed the pointers that tell the operating system where the start and end of BASIC text is, so that the system thinks there is no BASIC program in memory.

All we need to do is change the pointers back to what they were originally, and the BASIC program will reappear. RENEW, at the end of this article, is a program that will accomplish this feat. Actually, any UNNEW program will perform the same task when used with a reset switch.

RENEW is in the form of a BASIC loader—it reads numbers from data statements and pokes them into memory. RENEW is set up to store the machine-language program beginning at location 50000. If that location is being used by other utilities, you can select any other usable RAM location by changing the value of SA in line 10. Type RENEW into your computer and save it first. When you run it, it will perform the pokes and give you the command to use to renew or restore your BASIC program. Write down the command. If you don't change the value of SA, the command will be:

SYS50000:CLR

Now, when you have a BASIC program in memory (the RENEW loader is still there, if you want to use it to test out the system), and you press the reset switch, typing LIST shows that the program is apparently gone. Just type the SYS and CLR commands you wrote down before, and press RETURN. Now type LIST. Voila—Your program has returned unscathed!

Daily Use

Once you've installed a reset switch, add RENEW to the list of programs you load into your Commodore 64 when you first turn on your machine. Load and run it immediately, then forget about it. RENEW must be already poked into memory in order to save your BASIC program should your 64 lock up. Now, program to your heart's content, just as you normally do. If your computer locks up, just press the reset switch, type the SYS50000:CLR command, and you're back in business. No loss of valuable programming time. RENEW will also restore your BASIC program if you type NEW (which resets the BASIC pointers, making the computer think there is no program in RAM), or if you type SYS64738, which performs a "warm/cold start." It won't be of any help, however, if electrical power to RAM is lost, as in a power outage, or if the computer is turned off. The security of having RENEW tucked safely away in memory should be no substitute for regular saving of your programs.

If you do any amount of programming, get in the habit of using RENEW in combination with a reset switch—either one you install yourself, or one of the several that are on the market. I know it has saved my tail many times, and I'm sure it will save yours. **C**

C64 RENEW

```
7 REM ************
8 REM RELOCATABLE-CHANGE SA= IN LINE 10
9 REM ************
10 SA=50000:FOR I=SA TO SA+21:READ N:POKE I,N:NEXT
20 DATA 169,8,141,2,8,32,51,165,24,165,34,105,2
30 DATA 133,45,165,35,105,0,133,46,96
40 PRINT"TO RENEW, TYPE: SYS";SA;":CLR"
```

END

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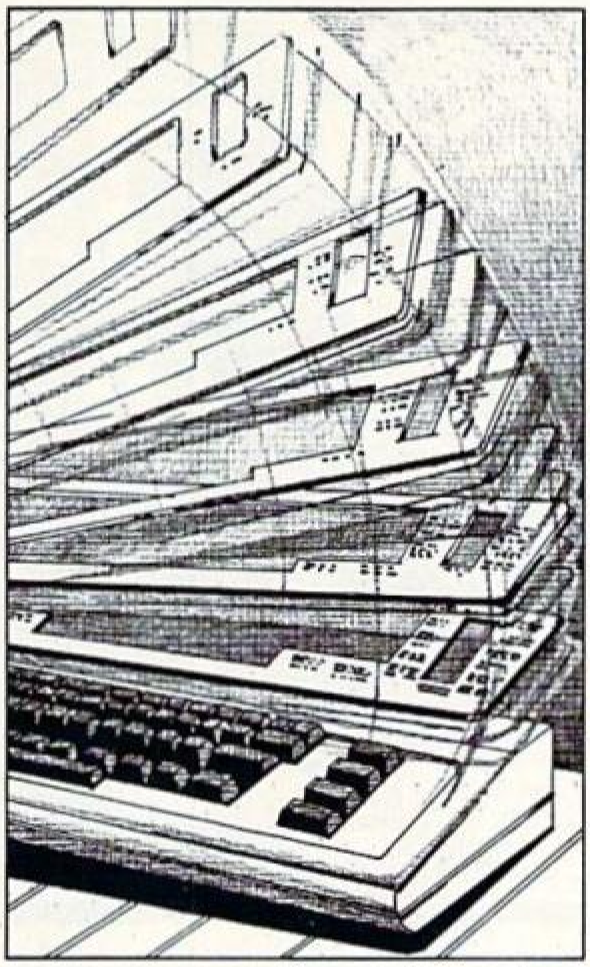
BY DENNIS BLOOMFIELD

DB's Cheapsheet

for Commodore Computers with Printer

There are several companies selling keyboard overlays for Commodore computers. These overlays are more commonly called "cheatsheets" and are very handy items. If you have ever stopped working and spent five or ten minutes pouring over a program manual to find the correct syntax for a command, you know what I mean. Having all the commands on the keyboard can save a lot of your time.

Most overlays are designed for a specific application, but some come blank so you can customize them to your own needs. If you want to buy more than two or three of these cheatsheets, you will spend quite a bit of money on them. Since I already paid for printer paper, I decided to create a program that would produce blank keyboard overlays using my Commodore 64. I am basically a cheap person—thus the name "DB's Cheapsheet."



This program will print a blank full-keyboard overlay (cheatsheet), and works with the VIC 20 or Commodore 64 equipped with a dot-matrix printer. An overlay does not fit on a single sheet of 8-1/2 by 11-inch paper, so you must have a printer that uses fanfold paper, like the Commodore 1525. Commodore 16 and Plus 4 owners should study the program and use the code as a starting point for writing a similar program for their keyboard configurations.

The primary techniques used in this program are the use of string constants and concatenation (adding several strings together to form a larger string). Operating the program is simple. Line up the printer at the top of a page, and run the program. After an overlay has been printed, you will have the option of printing another. If you want a more sturdy overlay, glue it onto poster board prior to trimming it. It should be obvious where to trim the finished Cheapsheets.

Program lines that contain nothing but colons may be omitted, as may REM statements.

(VIC 20 omit apostrophe and last four letters in each program line.)

Before typing this program, read "How to Enter Programs" and "How to Use the Magazine Entry Program." The BASIC programs in this magazine are available on disk from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007, 1-800-831-2694.

DB's Cheapsheet

```
90 GOSUB 900'BDMG
100 PRINT"[CLEAR,RVS]DB'S
    CHEAPSHEET"'BAUA
110 PRINT"[DOWN4]PRINTER READY (Y/N)
    [SPACE2]Y";:INPUT"[LEFT3]";Y$
    :IF Y$<>"Y"THEN 100'GLAK
120 PRINT"[DOWN]WORKING. . . "'BAPA
130 :'ABHX
140 REM  START PRINTING'BNKD
150 :'ABHA
160 OPEN 1,4'BDWC
170 :'ABHC
180 REM  LINES # 0-5'BJPF
190 :'ABHE
200 PRINT#1,S1$+B1$;'CJZY
210 FOR X=1 TO 60:PRINT#1,B3$;:NEXT
    :PRINT#1,B2$'GSAE
220 PRINT#1,BL$:PRINT#1,BL$'CLKB
230 PRINT#1,S1$+B6$+S1$+S3$+B1$;'FSFG
240 FOR X=1 TO 14:PRINT#1,B3$;:NEXT
    :PRINT#1,B2$+S1$+S1$+S1$+B6$'KFJM
250 PRINT#1,S1$+B6$+S1$+S3$+B6$;'FSKI
260 PRINT#1,S1$+S3$;:PRINT#1,B4$;
    :FOR X=1 TO 14:PRINT#1,B3$;
    :NEXT'IEMM
270 PRINT#1,B2$+S1$+S3$+SP$+B6$'FRIJ
280 :'ABHE
290 REM  LINES # 6-15'BKUH
300 :'ABHW
310 FOR X=1 TO 10'DERA
320 PRINT#1,S1$+B6$+S1$+S3$+B6$+LEFT$
    (S2$,29)+B6$+S1$+S3$+SP$+B6$'MPQP
330 NEXT'BAEA
340 :'ABHB
350 REM CLOSE LINE # 15'CHXE
360 :'ABHD
370 PRINT#1,S1$+B6$+S3$+SP$+SP$+B1$;
    :FOR X=1 TO 7:PRINT#1,B3$;
    :NEXT'LILS
380 PRINT#1,B5$+LEFT$(S2$,
    29)+B6$+S1$+S3$+SP$+B6$'IDDQ
390 :'ABHG
400 REM  LINES # 16-55'BLRB
410 :'ABHY
420 FOR X=16 TO 55'DFAD
430 PRINT#1,S1$+B6$+S3$+SP$+SP$+B6$+L
    EFT$(S2$,37)+B6$+S1$+S3$+SP$+B6$'
    NSET
440 NEXT'BAEC
450 :'ABHD
460 REM  LINE # 56'BHSG
470 :'ABHF
480 PRINT#1,S1$+B6$+S3$+SP$+SP$+B4$;
    :FOR X=1 TO 7:PRINT#1,B3$;
    :NEXT'LIOU
490 PRINT#1,B2$+LEFT$(S2$,29)+B6$+S1$
    +S3$+SP$+B6$'IDAS
```

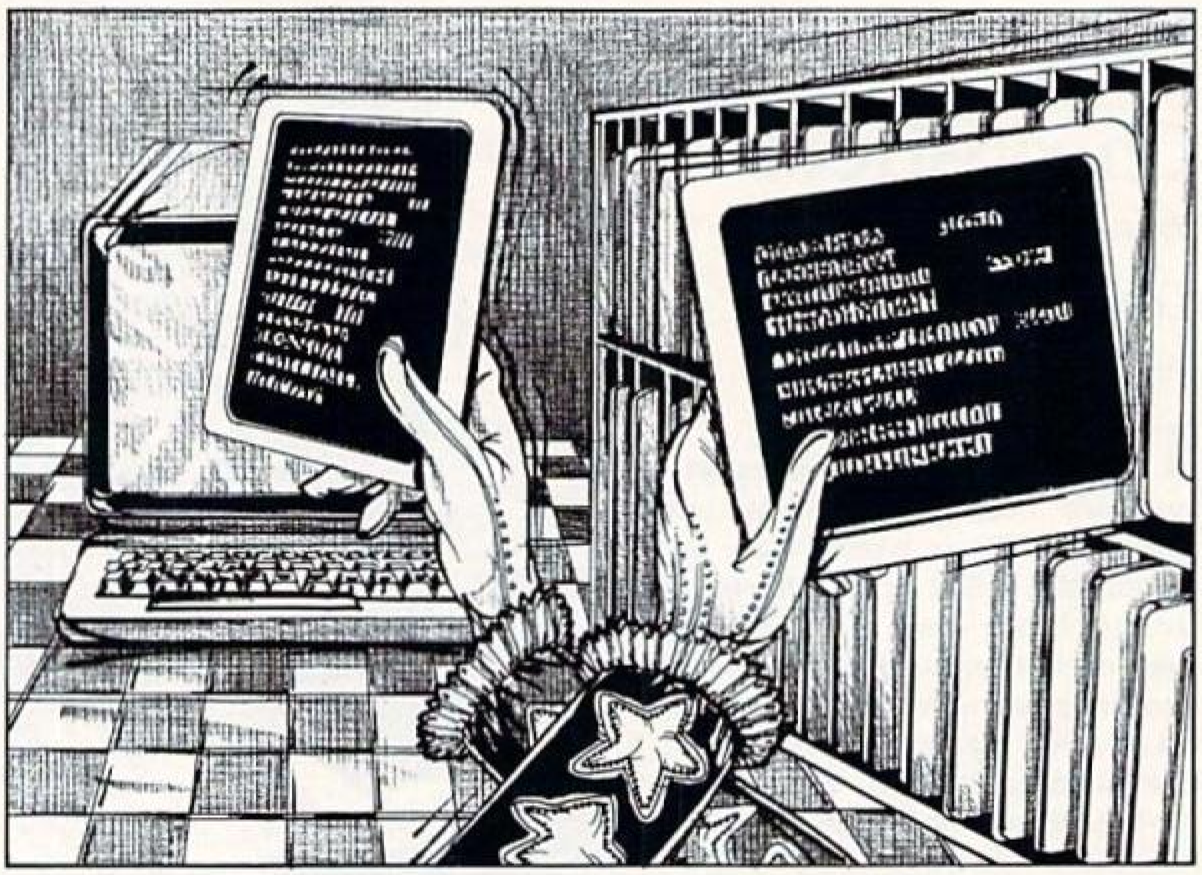
Continued on pg. 128

PROGRAMMERS' TIPS

BY IAN ADAM

On the Move

A Screen Mover for the Commodore 64 and VIC 20



Anyone who has done much interactive programming would agree that it would be very handy to be able to save a screen of information, swap screens in and out, and so forth. "Screen Mover" provides exactly that function, and makes it so easy, it's almost fun. A couple of simple commands from BASIC, and screens can be saved, moved around, and recalled, almost totally at will.

Screen Memory

To understand how this program works, it is helpful to know how the screen display is generated. In theory, there's no reason that the video display can't be manipulated just like any other data. The image on your TV or monitor screen is stored in RAM, one byte of memory representing one letter on the screen. When information is to be displayed, the central processor in your computer simply stores it in a specific area of memory. The video chip operates quite independently, almost like a separate computer-within-a-computer. It reads the information directly from this RAM, and uses it to build up the screen display. Change the contents of RAM, and the display changes automatically.

There are two blocks of RAM used to build the video display. Each one is the same size as the screen itself—1000 bytes for the 64's screen of 25 rows by 40 characters, 506 bytes for the VIC 20's 23-by-22 format. The first block, screen memory, contains the actual characters shown on the screen. This is like a black-and-white picture—all the details but no color. The second block, known as color RAM, is the same size and stores a color code for each character. These are the paint brushes, used to give color to the picture.

In order to make a message appear on the screen, you have to store the appropriate character codes in the screen memory, and the code for the color you want in the corresponding color RAM. All that may sound a little complicated, but you've done it before—it happens automatically every time you print a message.

> *With a couple of simple commands from BASIC, screens can be saved, moved around, and recalled quickly, using this program.*

Moving

Since screen memory and color RAM are in normal memory space, you can move them around, rearrange them, and so on. This can be done with BASIC, using a straightforward FOR-NEXT loop. The programming is not particularly difficult, but it is a nuisance, and runs into that same old problem ... BASIC is so slow!

However, the Screen Mover program will give you the capability to transfer screens of information (or of color) around inside your computer, under complete control. And, because it is written in machine language, it is extremely fast. It is also very easy to use. The program adds a simple new command to BASIC, taking advantage of the SYS routine. The easy way to do this is to set variable SC equal to the start location of the machine code. The format is then

SYS SC, SP [, EP]

SP is "starting page"—the page where the start of the screen you want to move is presently located. (A "page" is defined as 256 bytes. It takes four such pages to hold one screenful of information.) EP is "end page"—the page of memory where you want the image to end up. EP is optional—you may delete it if you wish, in which case the image will be transferred to the current screen location. (The

Table 1

NORMAL MEMORY LOCATIONS

	SCREEN	COLOR
Commodore 64	1024 page 4	55296 page 216
VIC 20	7680 page 30	38400 page 150
VIC with expansion	4096 page 16	37888 page 148

page number is just the memory address, divided by 256.) On the 64, the screen is normally located at page 4, and the color memory is always at page 216. On the VIC 20, these locations will move with the memory configuration. See Table 1 for these locations.

Setting Up

Go ahead and type the program in; it won't take long. Be particularly careful with the data statements, since they must be perfect. Now that you're finished typing, take a moment to save a backup copy to disk or tape before you run it. With any machine-language program, there is always a possibility that the computer could lock up if you've make a typing error. If this should happen, you'll appreciate having that backup copy. Just reload, check for typos, and try again.

When you run the program, you will first be asked where to store the code. The machine language is totally relocatable, so you can pick anywhere that it will not be in conflict with BASIC or other data. A handy location in either computer is 828, which is the start of the cassette buffer. An alternative for the 64 is 49152, in the high RAM not used by BASIC. Once the code is stored, you can delete the BASIC program with NEW, and the Screen Mover will still be there, waiting to be used.

Using It

Just imagine the uses in your programming. You can prepare a full screen of material out of sight, and pop it into view immediately whenever you want, without the user having to wait for BASIC to print it. You can even save graphics.

Here's an example of the Screen Mover put to use. Let's say you've prepared a screen of instructions or a menu for a new program—and it's in full color. To save the screen to high memory in the 64, use SYS 828, 4, 192. The screen will be transferred from starting page 4, its normal location, to end page 192, in high RAM. Also store the color memory next to it with SYS 828, 216, 196.

Now, you can proceed to develop the program further, refine it, save it, whatever. When you want the screen back, just type SYS 828, 192 to get the text. Because we don't specify the end page, it automatically goes to the screen. Then SYS 828, 196, 216 gets that fine paintwork back.

Notes to You

As we noted above, the locations will differ on the VIC. Just check the accompanying table to find screen and color memory for your machine. Unfortunately, the unexpanded VIC offers little spare RAM to store screens in. The data is best stored at the top of BASIC RAM, where it should be protected from BASIC first.

One final caution—be careful where you transfer data to, since whatever is there to begin with will be obliterated. If you should happen to transfer a screen into your BASIC program area, the program will be destroyed. If you ever transfer into zero page, the computer will suffer an extreme case of amnesia, and will have to be reset or cycled off and on again to regain control. A good memory map will help chart the route.

That, in a nutshell, is it. I hope that you find this little program useful, and that it helps you to build better interactive programs. And keep those programs on the move! ■

Before typing these programs, read "How to Enter Programs," and "How to Use the Magazine Entry Program." The BASIC programs in this magazine are available on disk from Loadstar, P.O. Box 30007, Shreveport, LA 71130-0007, 1-800-831-2694.

Screen Mover for the VIC

Do not use the Magazine Entry Program with this version.

```
70 PRINT CHR$(147)"* SCREEN MOVER *"
80 PRINT"[DOWN]WHERE SHALL I STORE"
90 PRINT"THE CODE?"
100 PRINT"(828 IS GOOD)"
110 INPUT SC
120 GOSUB 1000
130 PRINT"[DOWN]CODE STORED OK
140 PRINT"[DOWN]SYS"SC", SP, EP
150 PRINT"TO ACTIVATE
160 END
1000 FOR I = SC TO SC+61
1010 READ A: POKE I, A
1020 CH = CH + A
1030 NEXT
1040 IF CH = 8979 THEN RETURN
1050 PRINT"ERROR - CHECK DATA":STOP
1100 DATA 32,241,215,134,252,160,0,
     132,251,132,253,177,122,201,44,
     208
1110 DATA 6,32,241,215,138,208,18,173,
     2,144,42,173,5,144,41,240
1120 DATA 73,128,144,3,24,105,8,106,
     106,133,254,162,2,160,0,177
1130 DATA 251,145,253,200,208,249,230,
     252,230,254,202,208,240,96
```

END

Screen Mover for the 64

```
70 PRINT CHR$(147)"* SCREEN MOVER
   *"'CFLJ
80 PRINT"[DOWN]WHERE SHALL I STORE
   THE CODE?"'BAWM
90 PRINT"(828 AND 49152 ARE
   GOOD)"'BAXK
100 INPUT SC'BCBV
110 GOSUB 1000'BECW
120 PRINT"[DOWN]CODE STORED
    SUCCESSFULLY"'BATE
130 PRINT"[DOWN]SYS"SC", SP, EP
    [SPACE2]TO ACTIVATE"'BCRF
140 END'BACY
1000 FOR I = SC TO SC+50'EHPW
1010 READ A: POKE I, A'CFDV
1020 CH = CH + A'CFDW
1030 NEXT'BAEV
1040 IF CH = 7963 THEN RETURN'EGNA
1050 PRINT"ERROR - CHECK DATA"
     :STOP'CBBE
1100 DATA 32,241,183,134,252,160,0,
     132,251,132,253,177,122,201,44,
     208'BJFF
1110 DATA 6,32,241,183,138,208,7,173,
     24,208,106,106,41,60,133,254'BFYG
1120 DATA 162,4,160,0,177,251,145,253,
     200,208,249,230,252,230,254,
     202'BJKH
1130 DATA 208,240,96'BKVY
```

END

BY ISAAC MALITZ

Sorting Techniques: The Bubble Sort

One of the most common tasks that computers must perform is to arrange a large amount of information in a certain order. For instance, if a computer is used to track the scores of people in a bowling tournament, then we would want the computer to be able to arrange all of the players in order by total score. If a computer is used to track the names and phone numbers of all the people you know, then we would want the computer to be able to arrange this information alphabetically by name.

The task of arranging information in numerical or alphabetical order is known as "sorting." If you write computer programs frequently, sooner or later you will probably have to write a routine that sorts some information. Sorting is done so frequently in commercial applications of computers that computer scientists have done extensive research into the design of very fast sorting techniques.

We are going to present one of the most famous techniques for sorting information. This technique is known as the "bubble sort." Although it is not the fastest technique possible, it is important because:

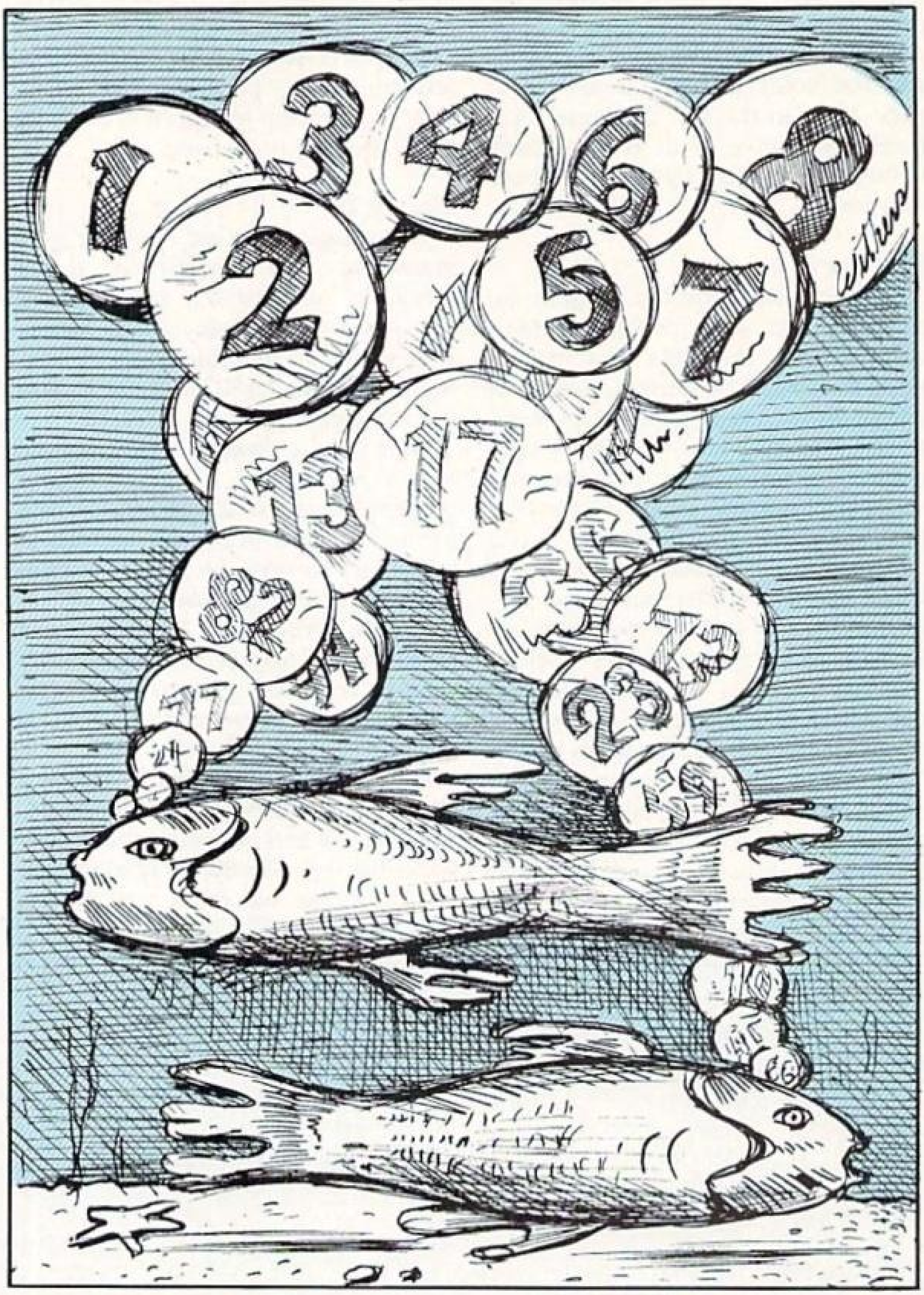
It is elegant and easy to understand.

It can be programmed in just a few lines.

For many situations, it is plenty fast.

The concept of a bubble sort can be modified and elaborated in many ways, to produce much more powerful sorting techniques. (We will give an illustration of this later in the article.)

An Example of a Bubble Sort



The fastest way to understand how a bubble sort works is to look at an example. Suppose we want to arrange the following five numbers in ascending order (smallest number first):

51 23 67 34 89

To get these numbers in the desired order, the bubble sort looks for pairs of adjacent numbers which are in the wrong order, switches them, and continues doing this until everything is in the correct order. Let's see how it works with this example.

Starting from the left, we look at the first two entries in the list:

51 23 67 34 89

These two entries are in the wrong order, so we switch them. The result is:

23 51 67 34 89

Now we look at the next pair of entries in the list:

23 51 67 34 89

These two entries are in the correct order, so we leave them alone. Now we look at the next pair of entries in the list:

23 51 67 34 89

These two entries are in the wrong order, so we switch them. The result is

23 51 34 67 89

Now we look at the next pair of entries in the list:

23 51 34 67 89

These two entries are in the correct order, so we leave them alone.

We have now reached the end of the list, but there are still some entries which are not in the correct order, so we start back at the beginning again.

The first two entries are in the correct order, so we leave them alone.

```
  23  51  34  67  89
```

Now we look at the next two entries:

```
  23  51  34  67  89
```

These two entries are not in the correct order, so we switch them. The result is

```
  23  34  51  67  89
```

The list is now in the correct order, so we are finished.

Depending on how many elements are in the list and how badly they are out of order, it is sometimes necessary to make a large number of "passes" through the list to get everything in order.

The technique is called "bubble sort" because it causes large numbers to gradually "float" to the right and small numbers to gradually "sink" to the left. This floating and sinking continues until everything is in the correct order.

Programming a Bubble Sort in BASIC

Listing 1 shows one way of programming a bubble sort in BASIC. This program will begin by filling the array A() with a list of six random integers between 0 and 100. Then the program will perform a bubble sort on the array. The program will display the array each time a pair of elements is shifted, so that you can follow the progress of the sort. So, for instance, if the values in the array are 23 12 45 19 91 16, then you will see the following display on your screen.

```
 23  12  45  19  91  16
 12  23  45  19  91  16
 12  23  19  45  91  16
 12  23  19  45  16  91
 12  19  23  45  16  91
 12  19  23  16  45  91
 12  19  16  23  45  91
 12  16  19  23  45  91
```

The classic "bubble sort" can be programmed in just a few lines, is elegant and easy to understand, and is plenty fast for many situations.

Listing 1. Bubble Sort

```
1 REM BUBLSORT
100 DIM A(6)
200 FOR I = 1 TO 6
210 A(I)  = INT((100)*RND(0))
220 PRINT A(I);
230 NEXT I
240 PRINT
300 F=0
310 FOR I = 1 TO 5
320 IF A(I)  <= A(I+1)  THEN 370
330 X=A(I):Y=A(I+1)
340 A(I)=Y:A(I+1)=X
350 F=1
360 FOR J=1 TO 6:PRINT A(J);:NEXT J:PRINT
370 NEXT I
400 IF F=1 THEN 300
```

How the Program Works

The first section of the program, lines 100-240, fills the array A() with six random integers between 0 and 100, and displays the values on the screen. The remainder of the program is the actual bubble-sort routine. The heart of the routine is a FOR-NEXT loop in lines 310-370 which moves across the array from beginning to end, switching neighboring elements that are out of order.

For each value of I, the computer looks at the array elements A(I) and A(I+1). If A(I) is less than or equal to A(I+1), nothing is done. However, if A(I) is greater than A(I+1), then the commands in lines 330-360 are executed.

Lines 330 and 340 switch the values in A(I) and A(I+1). For instance, if I is 2, and A(2) is 94 and A(3) is 78; then after lines 330-340 have been executed, A(2) will be 78 and A(3) will be 94.

Line 350 sets the variable F to one. This signifies that at least one "switch" was performed during the FOR-NEXT loop. We will explain more about this in a moment. Line 360 displays all of the elements of A() in their current order, so that we can watch the progress of the sort.

So the FOR-NEXT loop in lines 310-370 makes one "pass" through the array A(), and switches any pairs of neighboring elements which are out of order. As we learned earlier, it may take a number of passes to get everything in proper order. So we want to repeat the entire FOR-NEXT loop, over and over again, until everything is in the proper order.

To accomplish this, we must keep track during each FOR-NEXT loop of whether any elements were switched. That is the purpose of the variable F. At the beginning of the loop (in Line 300), F is set to zero. If any elements are switched during the loop, F will be set to one. When the FOR-NEXT loop is completed, we check the value of F (line 400). If F is 1, then it is necessary to make another pass, so we go back to line 300 (and make another pass through the FOR-NEXT loop). However, if F is 0, then it is not necessary to make any more passes — everything is in proper order, and we are finished.

Tips on Using the Bubble-Sort Technique

If you need to do some sorting in one of your own programs, you can use lines 300-400 from our sample program as is, except for these changes.

In our example, we dimensioned A() to have only six elements. In your own program, you probably will need to make A() much larger. Whatever you dimension it to, change line 310 accordingly. For instance, if you set A() to DIM A(100), then line 310 should be:

```
310 FOR I = 1 TO 99
```

You also will probably want to leave out line 360, which gives you a running account of the status of A( ). You can speed up the program slightly by changing lines 330-340 to the following:

```
330  Z=A(I):A(I)=A(I+1)
340  A(I+1)=Z
```

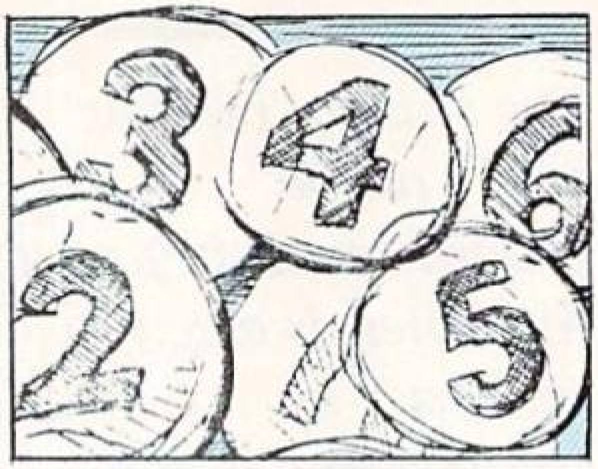
This accomplishes the same job as before — exchanging the values which were in A(I) and A(I+1) — but it does the job with three commands instead of four.

An Improvement on the Bubble Sort

The bubble sort is not a highly efficient sorting technique. However, because of its simplicity and elegance, we can easily identify some of its major shortcomings, and evolve much more powerful sorting techniques.

One obvious shortcoming of the bubble sort is that it moves elements only one position at a time. For instance, here is how a bubble sort would sort the following list of numbers (note that only the first and last entries are out of order):

```
60  20  30  40  50  10
20  60  30  40  50  10
20  30  60  40  50  10
20  30  40  60  50  10
20  30  40  50  60  10
20  30  40  50  10  60
20  30  40  10  50  60
20  30  10  40  50  60
20  10  30  40  50  60
10  20  30  40  50  60
```



Even though only two entries in the sequence were out of order, the bubble sort had to go through a great deal of work to get them into their proper position. In general, when two entries are out of order and they are a large distance from each other, the bubble sort has to go through a lot of steps to get the two entries into their proper positions.

The basic problem here is that a bubble sort compares and switches only entries which happen to be adjacent. This suggests a way in which we can make an improvement on the bubble sort technique. Let's revise the technique so that it can compare and switch entries which are a long distance apart.

Let's suppose that we want to sort a sequence of six numbers. We will begin by comparing the two entries which are at the beginning and end. Then we will compare entries which are a distance of four apart. Then we will compare entries which are a distance of three apart, two apart, and one apart. The following example will show you how this sort will work.

Let's suppose we want to sort these six numbers:

```
79  71  68  41  75  42
```

The sort will proceed as follows:

```
79  71  68  41  75  42
42  71  68  41  75  79
42  71  68  41  75  79
42  71  68  41  75  79
41  71  68  42  75  79
41  71  68  42  75  79
41  71  68  42  75  79
41  71  68  42  75  79
41  42  68  71  75  79
41  42  68  71  75  79
41  42  68  71  75  79
41  42  68  71  75  79
41  42  68  71  75  79
41  42  68  71  75  79
41  42  68  71  75  79
41  42  68  71  75  79
```

This is obviously a much more efficient way to sort than the bubble sort. On the average, this technique is about twice as fast as the bubble sort.

The program in Listing 2 shows how to implement our new sorting technique. Much of this program is identical to our bubble sort program. The main difference is the use of a new variable, D, which starts at five and goes down to one. (The value of D is controlled by a FOR-NEXT loop in Lines 300-400.) D determines the "distance" of the two elements we are comparing and switching. For instance, suppose I is two, and D is three. Then in Lines 320-340 we will be comparing the second entry with the fifth entry (and switching them if necessary).

Our new technique is much more efficient than a bubble sort, but it, too, has shortcomings. If you trace it through some examples, you will see that it spends a great deal of time looking at pairs of entries which are already in the correct order. There are ways to minimize this problem. If you are interested in learning more about this, find out about the "Quicksort" technique, which is discussed in many textbooks on programming algorithms or data file management.

Listing 2. Faster Sort

```
1 REM FASTRSORT
100 DIM A(6)
200 FOR I = 1 TO 6
210 A(I) = INT((100)*RND(0))
220 PRINT A(I);
230 NEXT I
240 PRINT
300 FOR D = 5 TO 1 STEP -1
310 FOR I = 1 TO 6-D
320 IF A(I) <= A(I+D) THEN 370
330 X=A(I):Y=A(I+D)
340 A(I)=Y:A(I+D)=X
360 FOR J=1 TO 6:PRINT A(J);:NEXT J:PRINT
370 NEXT I
400 NEXT D
```

Isaac Malitz is a computer consultant and systems designer who specializes in accounting and database applications. He is co-author of *The Commodore 128 Mode: An Inside View,* published by Microcomscribe.

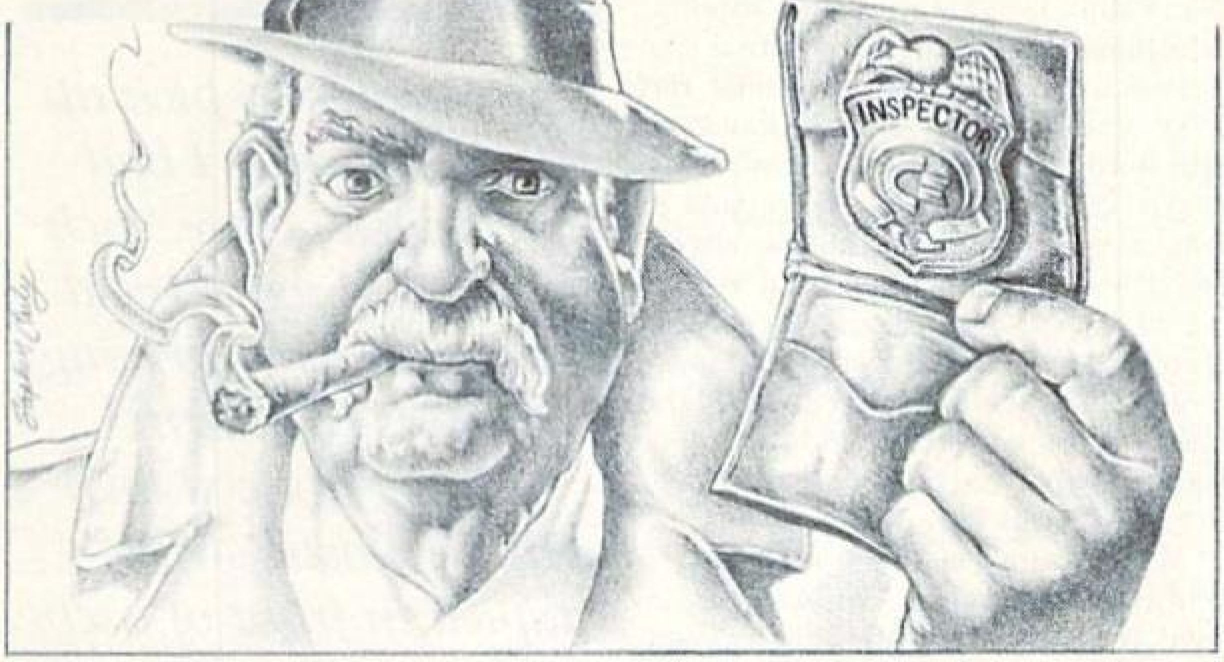
JOYSTICK LUNATIC

BY STEVE FINKEL

The Strange Case of John Q. Public

Part 2

***If** you remember from the February/March issue, the wealthy John Q. Pubic has been murdered in eleven different ways. At the conclusion of Part 1, the Inspector had brought together the twelve suspects for questioning. Each suspect had strong motives, was known to have threatened murder, and had had plenty of opportunity to do so. Now the Inspector is about to uncover the killer.*



Present in room (in order of appearance): the Inspector, the Maid, the Caddy, Mrs. Public, the Sister-in-Law, the Butler, the Cook, the Chauffeur, the Psychic, Uncle Fred, the Personal Secretary, the Suspicious Witness Couple, and Mr. Whipple.

Inspector: Just to set the record straight, I want it known that even I had a brush with our dear departed Mr. Public. He publicly humiliated me by challenging me to discover the killer in the *Deadline* and *Suspect* adventure games for the Commodore 64. When I couldn't do it, I became a laughingstock, lost my job as chief inspector, and turned to the bottle. I became a drunk, unable to think clearly or function as a detective.

Mrs. Public: And now you've turned your life back around?

Inspector: No, I'm still a drunk, unable to think clearly and function as a detective. This case is my last chance, and if I blow this one...

(The Inspector casts a longing eye to the solace of alcohol at the bar. The remaining people in the room cast suspicious eyes toward the competence of the Inspector.)

Mrs. Public: So you mean to tell us that Mr. Public is responsible for destroying your career and turning you into an alcoholic, and you, of all people, are responsible for finding the culprit?

Inspector: Did I mention that my wife left me as a result of my drinking?

(The room buzzes with excitement as a result of the Inspector's revelations. Suddenly THE LIGHTS GO OUT. There is a scream, and the lights are turned on.)

Inspector: I turned the lights out to get your attention. Mrs. Public, why did you scream?

Mrs. Public: I thought I was supposed to. Besides, I saw Mr. Whipple slip off to the bathroom to feel our toilet paper...and do I smell alcohol on your breath?

Inspector: This is getting us nowhere! I am now prepared to reveal who is responsible, how they did it, and why.

(Everyone in the room leans forward as if E. F. Hutton were going to speak.)

Inspector: We have eleven different possible causes of death, eleven different sets of clues, and eleven different murder weapons. Whipple, leave that toilet paper alone!

(Whipple, embarrassed, stuffs the sheet back into his wallet.)

Inspector: I gave this case my best shots—er, shot—and can with every certainty identify the culprit. Uh, anybody want to confess now and save us all some time?

(No response.)

Inspector: Okay, here goes. Mrs. Public, I noticed that you swore you would shoot your husband three times. But the powder marks on your husband's body indicate that the weapon was fired from a very short distance, perhaps right up against Mr. Public's chest. But he would never have let you get that close to him, which eliminates you as a suspect.

Which brings us to the Sister-in-Law...stabbing the life out of the unfortunate Mr. Public. What is most puzzling about the stab wounds is that they were administered with a knife that did not have a sharp edge, perhaps a butter knife. As one who enjoyed cooking as a hobby to the point that her kitchen was complete with a home computer program for recipes, the Sister-in-Law surely had dozens of sharper, more deadly, more painful knives and cleavers to use. If the Sister-in-Law had stabbed Mr. Public to death, I'm sure she would have elected to forego the butter knife in favor of a Ginsu knife, at the very least.

Which brings us to the faithful Butler—isn't that always the way in cases like this? You'd be as guilty as sin except for one fact: Mr. Public hated tea, and refused to drink it, even though he had you make it and serve him three times a day, just so he could kick the expensive silver tea service onto the floor and make you clean it up. If you wanted to poison him, you would have put the arsenic in his chocolate milk, which he drank daily with great relish, or even in the great relish.

Which brings us to the Cook, who used to make that great relish...we found Mr. Public's throat severed with your spatula, all right, but your alibi remains intact. You could not make bail because Mr. Public's lawyer jacked it up so high you could not afford to pay it, and so remained in jail. Therefore, you could hardly be the spatula slasher.

Which brings us to the Chauffeur, the man who swore he would make

Continued on pg. 116

Mr. Public breathe in carbon monoxide fumes. You had the motive and access to the cars and the garage, but you never had access to the car *keys*. Mr. Public kept all the car keys, refusing to even give you a copy, just to annoy you. As you recall, he always used to taunt you by asking you to bring the car around, and then chide you for not having the keys, and force you to push the car to the front of the house. But you could not then, or even on that fateful night, turn over the cars' ignitions.

Which brings us to the Psychic. Mr. Public did have a concussion, in which we found fragments of a crystal ball. The blow was so severe, it may indeed have killed him. But the responsible party is unknown, because we have discovered, partly through Mr. Public's efforts, that you are a complete fake. You are actually an out-of-work programmer who tried to pick up a little money through this astrology scam, whose only tools of the trade were a Commodore 64 and a *Micro Astrologer* disk. You cannot give anyone a concussion with a disk (it's *soft*ware), and you never owned anything even resembling a crystal ball.

Which brings us to Uncle Fred. Fred, would you hit this hockey puck with this hockey stick for me?

(Uncle Fred slaps at the puck and sends a slapshot screaming through the living room, the expensive picture window and the windshield of the Inspector's squad car.)

Inspector: That will cost you Fred ...anyway, this hockey stick is right-handed. The nine-iron used in the assault requires a left-handed swing, meaning you could not have swung with enough force to kill Mr. Public.

Which brings us to the Personal Secretary. We did find your contract lodged in Mr. Public's windpipe, cutting off his ability to breathe. Yet further examination revealed that the contract was missing one thing: your signature. It was a copy, cleverly planted there to incriminate you. In fact, I think a pattern may be emerging here, but I'm not really sure what it is.

> *I was able to pick up important clues I had overlooked before, such as the used windshield the corpse was carrying under his right arm.*
>
> *When I noticed there was an elastic string stapled in front of each of his ears, I put it together and had my man.*

Which brings us to the Suspicious Witness Couple. You came a long way just to be near the victim's house, a man who you just happened to despise, and whom you'd already threatened, coincidentally, at the exact time of the murder. Quite a coincidence indeed, wouldn't you say? Yes, so would I. Absolutely incredible how things like this sometimes occur. Which brings us to the Sleazy Black Market Guy...too bad he couldn't be here, because I think I need a good deal on a new windshield. Which leaves....

(All eyes now focus on Mr. Whipple.)

Inspector: Which brings us at last to Mr. Whipple...couldn't bear to have your tissue supply cut off, could you, Whipple? You would've killed him for half a squeeze. But from my observations of your disgustingly perverted obsession, Whipple, I would doubt that you would waste half a roll on the victim's neck. So you're off the hook.

(Everyone is stunned; the Inspector himself is the last remaining suspect, and he realizes that the others now know this.)

Inspector: Which brings us to the last remaining suspect, me...since I'm the only one left, I must have done it. I'll slap the cuffs on myself and take me away...no, wait! I *know* who did it and why!!

(The lights go out again. Mrs. Public screams again. It turns out to be the revenge of the Suspicious Witness Couple, who had earlier decided to give Mr. Public a taste of his own médicine by negating his electricity payment via telecommunications to the electric company's computer. Fortunately, it is two o'clock in the afternoon, and there is no need for lights, anyway.)

Inspector: Mrs. Public, you're too tense lately. You should probably try some decaffeinated coffee. Besides, the culprits are right here in this room!

Everyone (gasping in unision): But you've cleared us all, Inspector. Who could it be?!

Inspector: Who else? Everyone else in this room has an incriminating motive, a specific weapon, and the evidence that it was applied to the corpse. The coroner's report stated that the victim was indeed killed by any, some, a few, or all of the weapons used. The only two who would seem to be in the clear are the Maid, who found the deceased, and the Caddy, who found one of the alleged murder weapons.

(The Inspector stares out the window briefly, and then wanders over to be in front of the Caddy, waits briefly, then reaches down and pulls off a rubber mask covering the Caddy's face to reveal...)

Everyone: Mr. Public!!!!!

Inspector: You might as well confess right now, Public. We've got you cold.

Mr. Public: Oh yeah? On what charge?

Inspector: I place you under arrest for the murder of the Sleazy Black Market Guy.

(Everyone gasps, and the Inspector handcuffs Mr. Public and starts to lead him away.)

Mr. Public: Hold on! I'm not gonna take this rap by myself. I did it all right, but it was the Maid's idea!!

The Maid: You rat! You've ruined everything now!! I never loved you anyway. Once we had everyone else in jail, I would have killed you and kept everything for myself.

Inspector (to a Policeman who appears at just the right moment): Okay, take them both away.

Mrs. Public: I should have suspected from the first. She was an awful housecleaner, never able to make the beds right and there was always a strange film of saliva even after she dusted the bureau. How did you know, Inspector?

How The Inspector Knew:

I thought it was strange that I couldn't locate the Sleazy Black Market Guy, because he's always floating around the periphery on a case like this. But no matter how hard I looked, no matter how many stones I turned up, I could never turn up the Sleazeball. So I suspected foul play.

I went back to the coroner and reviewed the corpse. Yes, it had been killed by all those eleven methods, but in the process had become unrecognizable. Initially, being a trusting person by nature, I had taken everyone's word for it that it was Mr. Public lying in the morgue. Now, I was able to pick up important clues that I had overlooked before because I wasn't looking for them, such as the slightly used windshield the corpse was carrying under his right arm at the time of his death, which tipped me off to his true identity.

Once this was established, all the previous suspects were automatically in the clear, and I had identified the number one suspect (Mr. Public) for the number two crime (the murder of the Sleazy Black Market Guy). Now all I had to do was find Mr. Public.

Everyone else had been questioned about the night of the murder except for the only two people who didn't need an alibi, the Caddy and the Maid. The Maid wasn't really what you'd consider a looker, but even so, Mr. Public could never get away with wearing that maid outfit with his legs—uggh—which left the Caddy.

I recalled that when I had asked the Caddy for a mashie-niblick, he knew exactly what club to give me. This was extremely suspicious, because I myself thought I was asking for potato-and-corn stew. And I also recalled where I got most of the information that implicated everyone else in the case: that same Caddy. And I noticed that there was an elastic string stapled in front of each of his ears. I put it together and had my man.

Getting the Maid, too, was a bonus. I knew that when I fingered Mr. Public, he'd take the Maid down with him. That's the way it always happens in the movies.

So there's the case, tied up nice and neat. I'm off the bottle, Mrs. Public has her fortune back, the Sister-in-Law got a *Micro Cookbook* replacement disk. The Butler, Cook, Psychic, Personal Secretary and Chauffeur all got their jobs back. The Chauffeur even got keys for the cars. The Suspicious Witness Couple stayed in the big city, she hired on as a replacement for the Maid, he as the new Sleazy Black Market Guy.

I guess these things do work out if you ferret out the clues and approach them methodically and logically. I hear even Mr. Whipple is overcoming his problems and now only needs the occasional caress of a facial tissue to calm him down. And Mr. Public and the Maid are serving ten-to-life sentences for murder one in the federal pen.

Game, set and match, turn out the lights, the party's over. And as an added bonus, I managed to throw in plugs for ten different Commodore products. Case closed. ■

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ADVENTURE ROAD

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tremely tough game that some pros have called Infocom's most difficult.

The parser offers an amazing new feature that was introduced in *A Mind Forever Voyaging* (which is much easier than Infocom's "advanced" rating implies). When the program says, "I don't know the word 'examin'" (because you've misspelled it or used a word it doesn't know), you can now type, "oops examine," and the parser substitutes the correction in your previous command and executes it. This saves a lot of time if your typing is as bad as mine, or when you're trying to use the same verb on a succession of different items whose names aren't understood by the parser.

More Electronic Novels

A distinctly different twist on all-text adventuring rounds the bend in Synapse's *Brimstone* (reviewed in March/April *Commodore Microcomputers*). Written by poet/author James Paul, the story of Sir Gawain, a minor knight of the Round Table, is told in the third person. Instead of saying, "you see a white horse," the program would say, "Sir Gawain sees a white horse," to describe the situation. The result is a most unusual sense of atmosphere and tone that may feel unsettling until you've played it for awhile. *Essex*, another of Synapse Electronic Novels (also reviewed in March/April), is told from the traditional first-person perspective. A science fiction tale set on a starship that satirizes *Star Trek*'s Enterprise, *Essex* keeps you chuckling throughout a difficult trip to rescue a scientist who holds the key to defeating the alien Vollchons.

Fantasy role-players disappointed by previous attempts at turning the "Dungeons and Dragons" board game into computer form absolutely must explore the 16 mazes of *The Bard's Tale* from Electronic Arts. Old-fashioned monster whomping and spell casting, deviously designed 3-D mazes, superb graphics—and the ability to use Origin Systems' *Ultima III* characters that have already been developed into powerful magicians and fighters—make this unquestionably the best, perhaps the hardest, role-playing game in the "D & D" tradition. On the other hand, *Ultima IV*, new from Origin Systems and distributed by Electronic Arts, represents the most original approach to role-playing yet, a scenario so uncommon that I devoted a lengthy review to Lord British's latest in the March/April *Commodore Microcomputers*. (Except for *Bard's Tale*, *Essex*, and *Brimstone*, all the games I've discussed here are available for the Amiga as well as the C64 and C128.)

Now it's time for this adventurer to return to the maze for more gold and golem slaying, so I'll leave you with the news that Penguin Software is converting *Transylvania* and their other adventures to the new Comprehend system. Why? To take advantage of its superior parser and larger vocabulary capacity, and add some new puzzles to the games. And while many companies continue adapting novels and TV shows into adventures, Penguin president Mark Pelczarski recently revealed plans for the first graphic game based on a hit song—Jimmy Buffet's "Margaritaville." C

MOEBIUS

Continued from pg. 26

ace guards may ambush you. Sometimes you can weaken or kill an attacker out in the open by tossing shurikens, the razor-sharp martial arts weapon. In the temples, you can hurl fireballs at the monks. But if that fails to stop them, you'll have to fight it out action-style in a combat arena.

These full-screen combat scenes exhibit the best animation ever seen in this kind of game, scenes that are displayed in profile like *Karateka*'s. The author used videotapes to pattern the combat moves after those used by genuine martial arts combatants. Facing one foe at a time, you can fight with sword or kung fu. Each style affords a half-dozen moves aimed at different parts of the body—short upper kicks, long low punches.

This will prove the toughest part of the game for some people to master, but you can practice in unlimited training sessions before undertaking the actual adventure. (In fact, you can't even start until you've passed the tests in each skill.) And the animation speed is player-adjustable, so you may start in slow motion and step it up as your fingers grow more nimble and you've mastered each move.

Depicted in a digitized photo of a hooded monk, Moebius makes occasional appearances to express pleasure with your progress or sorrow upon hearing of your death. He'll reincarnate you three times, but after that you're dead, dead, dead. One of the best features of this two-disk game permits you to restart from your last saved position at any time—without having to quit and reload the program. This saves a lot of time. You don't have to copy a scenario disk to play on, and there is practically no disk access once you've entered Khantun.

The chests' and vials' contents and locations are randomized for each new game, so *Moebius* has extra replay value. With that in mind, the author included a vanity board that tells you the number of times each character (up to seven may be stored on the disk) has found the Orb. Easier to finish than *Ultima IV* or *The Bard's Tale*—though the demanding kung fu and swordfight sequences won't be mastered overnight—*Moebius* offers determined adventurers at least 50 hours of uncommon fantasy role-playing.

APSOFT-64

Continued from pg. 28

calls to the Commodore 64 kernal can save sprites, while the *ApSoft-64* command BLOAD can recall them.

Sprites are not the only special feature of the Commodore 64 that *ApSoft-64* supports. Joysticks, light pen, and paddles may be read with special commands. The SID chip can be played with the aid of *ApSoft-64* commands. And last but not least, *ApSoft-64* speeds up disk drive access time.

There are many commands provided by *ApSoft-64*, and while it isn't necessary to go through the complete command set, one command does deserve special mention. *ApSoft-64* provides the command "IN" to re-start *ApSoft-64*, resetting it to the initial loading of the *ApSoft-64* software. This is a very important command that should be typed in each time you use a different program under *ApSoft-64*, but did not receive the attention in the manual that it deserves. Since *ApSoft-64* must do a great deal of memory manipulation when handling graphics, the memory is left in a messy state when a graphics program is ended. You may load in the next program to find that it won't run, or that *ApSoft-64* no longer recognizes certain commands. The IN command should be used between every program.

There are 20 programs included on the disk besides *ApSoft-64* itself. Many of the special commands are demonstrated in these programs, and the graphics modes are well displayed. Several of the programs were originally Apple II public domain programs. There is a well-known database program called "Filecabinet" and a checkbook balancing program. A terminal program is included to help transfer Applesoft program files.

FS! Software also markets several Applesoft programs on Commodore 64-readable disks. Currently five disks are offered, at the price of $19.95 each. There are the Great Games disk, Math & Statistics disk, Advanced Math disk, Business and Finance disk, and Mixed Titles disk.

After working with the *ApSoft-64* program for some time, I am very impressed with the quality of the package. Now I can trade programs with friends who have other computers. I hope this provides a challenge to the program writers out there.

CARRIERS

Continued from pg. 31

the spring of 1942. The design routine can also be used to modify any of the existing scenarios. One slight change can turn the Japanese surprise attack on Pearl Harbor into the Battle of Pearl Harbor, a fascinating look at what might have happened if the Pacific Fleet had not been caught unaware. All of the scenarios carry suggestions for historically possible "what-if" variations.

Even if you never create an original scenario, the Design Manual is valuable for several other reasons. First, it allows you to introduce a measure of strategic flexibility to the game. Through the design option, you can select for yourself where your submarines in a scenario will be deployed. The composition of your task groups, which are pre-determined in every scenario according to their historical arrangement, can likewise be altered to suit your own ideas of strategy.

Secondly, in the absence of any player or strategy notes, the Design Manual is the next best thing. In the Design Manual, for instance, you will learn that carriers have a rating called a spot number, which equals the maximum number of planes that can fit onto the flight deck at one time. This number also equals the optimum size of an air strike. A careful reading of the Design Manual holds the key to attaining at least a basic understanding of the capabilities of the planes and ships at your disposal.

Carriers at War will not appeal to everyone. Gamers who like to experience the "feel" of battle may be disappointed by the game system, which distances you from the violent activity your orders have set in motion. Battles are represented by a simple flashing cursor on the screen and even the outcomes are seen secondhand through the battle reports.

If you can do without watching burning carriers sink beneath the waves and, instead, take satisfaction in the knowledge that you have out-maneuvered and out-thought your opponent, then *Carriers at War* will provide you with a tremendous amount of enjoyment. It is a game for people who relish a tense duel of nerves and wits. *Carriers at War* displays all the traits of an excellent war game—it's realistic, versatile, engrossing, and always a challenge.

HOW TO ENTER PROGRAMS in *Power/Play*

The programs which appear in this magazine have been run, tested and checked for bugs and errors. After a program is tested, it is printed on a letter quality printer with some formatting changes. This listing is then photographed directly and printed in the magazine. Using this method ensures the most error-free program listings possible.

Whenever you see a word inside brackets, such as [DOWN], the word represents a keystroke or series of keystrokes on the keyboard. The word [DOWN] would be entered by pressing the cursor-down key. If multiple keystrokes are required, the number will directly follow the word. For example, [DOWN4] would mean to press the cursor-down key four times. If there are multiple words within one set of brackets, enter the keystrokes directly after one another. For example, [DOWN,RIGHT2] would mean to press the cursor-down key once and then the cursor-right key twice.

In addition to these graphic symbols, the keyboard graphics are all represented by a word and a letter. The word is either SHFT or CMD and represents the SHIFT key or the Commodore key. The letter is one of the letters on the keyboard. The combination [SHFT E] would be entered by holding down the SHIFT key and pressing the E. A number following the letter tells you how many times to type the letter. For example, [SHFT A4,CMD B3] would mean to hold the SHIFT key and press the A four times, then hold down the Commodore key and press the B three times.

The following chart tells you the keys to press for any word or words inside of brackets. Refer to this chart whenever you aren't sure what keys to press. The little graphic next to the keystrokes shows you what you will see on the screen.

SYNTAX ERROR

This is by far the most common error encountered while entering a program. Usually (sorry folks) this means that you have typed something incorrectly on the line the syntax error refers to. If you get the message "?Syntax Error Break In Line 270", type LIST 270 and press RETURN. This will list line 270 to the screen. Look for any non-obvious mistakes like a zero in place of an O or vice-versa. Check for semicolons and colons reversed and extra or missing parenthesis. All of these things will cause a syntax error.

There is only one time a syntax error will tell you the 'wrong' line to look at. If the line the syntax error refers to has a function call (i.e., FN A(3)), the syntax error may be in the line that defines the function, rather than the line named in the error message. Look for a line near the beginning of the program (usually) that has DEF FN A(X) in it with an equation following it. Look for a typo in the equation part of this definition.

ILLEGAL QUANTITY ERROR

This is another common error message. This can also be caused by a typing error, but it is a little harder to find. Once again, list the line number that the error message refers to. There is probably a poke statement on this line. If there is, then the error is referring to what is trying to be poked. A number must be in the range of zero to 255 to be poke-able. For example, the statement POKE 1024,260 would produce an illegal quantity error because 260 is greater than 255.

Most often, the value being poked is a variable (A,X...). This error is telling you that this variable is out of range. If the variable is being read from data statements, then the problem is somewhere in the data statements. Check the data statements for missing commas or other typos.

If the variable is not coming from data statements, then the problem will be a little harder to find. Check each line that contains the variable for typing mistakes.

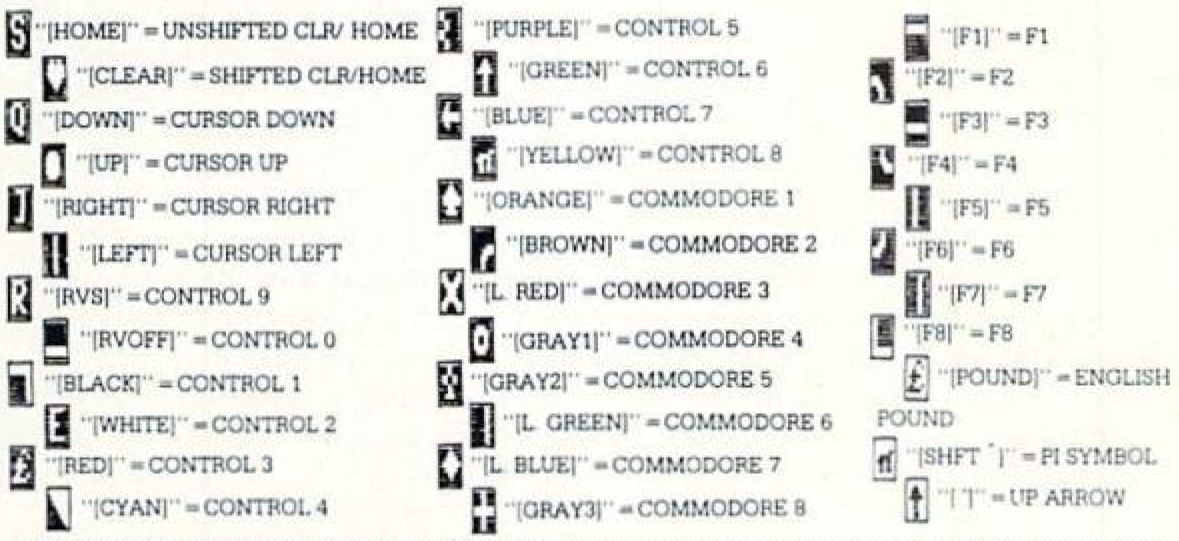
OUT OF DATA ERROR

This error message is always related to the data statements in a program. If this error occurs, it means that the program has run out of data items before it was supposed to. It is usually caused by a problem or typo in the data statements. Check first to see if you have left out a whole line of data. Next, check for missing commas between numbers. Reading data from a page of a magazine can be a strain on the brain, so use a ruler or a piece of paper or anything else to help you keep track of where you are as you enter the data.

OTHER PROBLEMS

It is important to remember that the 64 and the PET/CBM computers will only accept a line up to 80 characters long. The VIC 20 will accept a line up to 88 characters long. Sometimes you will find a line in a program that runs over this number of characters. This is not a mistake in the listing. Sometimes programmers get so carried away crunching programs that they use abbreviated commands to get more than 80 (or 88) characters on one line. You can enter these lines by abbreviating the commands when

CHART OF SPECIAL CHARACTER COMMANDS



"[HOME]" = UNSHIFTED CLR/ HOME
"[CLEAR]" = SHIFTED CLR/HOME
"[DOWN]" = CURSOR DOWN
"[UP]" = CURSOR UP
"[RIGHT]" = CURSOR RIGHT
"[LEFT]" = CURSOR LEFT
"[RVS]" = CONTROL 9
"[RVOFF]" = CONTROL 0
"[BLACK]" = CONTROL 1
"[WHITE]" = CONTROL 2
"[RED]" = CONTROL 3
"[CYAN]" = CONTROL 4
"[PURPLE]" = CONTROL 5
"[GREEN]" = CONTROL 6
"[BLUE]" = CONTROL 7
"[YELLOW]" = CONTROL 8
"[ORANGE]" = COMMODORE 1
"[BROWN]" = COMMODORE 2
"[L. RED]" = COMMODORE 3
"[GRAY1]" = COMMODORE 4
"[GRAY2]" = COMMODORE 5
"[L. GREEN]" = COMMODORE 6
"[L. BLUE]" = COMMODORE 7
"[GRAY3]" = COMMODORE 8
"[F1]" = F1
"[F2]" = F2
"[F3]" = F3
"[F4]" = F4
"[F5]" = F5
"[F6]" = F6
"[F7]" = F7
"[F8]" = F8
"[POUND]" = ENGLISH POUND
"[SHFT ↑]" = PI SYMBOL
"[↑]" = UP ARROW

GRAPHIC SYMBOLS WILL BE REPRESENTED AS EITHER THE LETTERS SHFT (SHIFT) AND A KEY ("[SHFT Q,SHFT J,SHFT D,SHFT S]") OR THE LETTERS CMDR (COMMODORE) AND A KEY ("[CMDR Q,CMDR G,COMDR Y,CMDR H]"). IF A SYMBOL IS REPEATED, THE NUMBER OF REPITITIONS WILL BE DIRECTLY AFTER THE KEY AND BEFORE THE COMMA ("[SPACE3,SHFT S4,CMDR M2]").

you enter the line. The abbreviations for BASIC commands are on pages 133-134 of the VIC 20 user guide and 130-131 of the Commodore 64 user's guide.

If you type a line that is longer than 80 (or 88) characters, the computer will act as if everything is ok, until you press RETURN. Then, a syntax error will be displayed.

THE PROGRAM WON'T RUN!!

This is the hardest of problems to resolve; no error message is displayed, but the program just doesn't run. This can be caused by many small mistakes typing a program in. First check that the program was written for the computer you are using. Check to see if you have left out any lines of the program. Check each line of the program for typos or missing parts. Finally, press the RUN/STOP key while the program is 'running'. Write down the line the program broke at and try to follow the program backwards from this point, looking for problems.

IF ALL ELSE FAILS

You've come to the end of your rope. You can't get the program to run and you can't find any errors in your typing. What do you do? As always, we suggest that you try a local user group for help. In a group of even just a dozen members, someone is bound to have typed in the same program.

If you do get a working copy, be sure to compare it to your own version so that you can learn from your errors and increase you understanding of programming.

If you live in the country, don't have a local user group, or you simply can't get any help, write to us. If you do write to us, include the following information about the program you are having problems with:

The name of the program
The issue of the magazine it was in
The computer you are using
Any error messages and the line numbers
Anything displayed on the screen
A printout of your listing (if possible)

Send your questions to:

Power/Play Magazine
1200 Wilson Drive
West Chester, PA 19380
ATTN: Program Problem

How to Use the Magazine Entry Program

The Magazine Entry Program on the facing page is a machine language program that will assist you in entering the programs in this magazine correctly. It is for use with the Commodore 64 only and was written by Mark Robin using the IEA Editor/Assembler. Once the program is in place, it works its magic without you having to do anything else. The program will not let you enter a line if there is a typing mistake on it, and better yet, it identifies the kind of error for you.

Getting Started

Type in the Magazine Entry Program carefully and save it as you go along (just in case). Once the whole program is typed in, save it again on tape or disk. Now RUN the program. The word POKING will appear on the top of the screen with a number. The number will increment from 49152 up to 50052, and just lets you know that the program is running. If everything is ok, the program will finish running and end. Then type NEW. If there is a problem with the data statements, the program will tell you where to find the problem.

Once the program has run, it is in memory ready to go. To activate the program, type SYS49152 and press RETURN. When the READY prompt is displayed, type TEST and press RETURN. You are now ready to enter the programs from the magazine.

Typing the Programs

All the program listings in this magazine that are for the 64 have an apostrophe followed by four letters at the end of the line (i.e., 'ACDF). The apostrophe and letters *should* be entered along with the rest of the line. This is a checksum that the Magazine Entry Program uses.

Enter the line and the letters at the end and then press RETURN, just as you normally would.

If the line is entered correctly, a bell is sounded and the line is entered into the computer's memory (without the characters at the end).

If a mistake was made while entering the line, a noise is sounded and an error message is displayed. Read the error message, then press any key to erase the message and correct the line.

IMPORTANT

If the Magazine Entry Program sees a mistake on a line, it *does not* enter that line into memory. This makes it impossible to enter a line incorrectly.

Error Messages and What They Mean

There are six error messages that the Magazine Entry Program uses. Here they are, along with what they mean and how to fix them.

NO CHECKSUM: This means that you forgot to enter the apostrophe and the four letters at the end of the line. Move the cursor to the end of the line you just typed and enter the checksum.

QUOTE: This means that you forgot (or added) a quote mark somewhere in the line. Check the line in the magazine and correct the quote.

PARENTHESIS: This means that you forgot (or added) a parenthesis somewhere in the line. Check the line in the magazine again and correct the parenthesis.

KEYWORD: This means that you have either forgotten a command or spelled one of the BASIC keywords (GOTO, PRINT..) incorrectly. Check the line in the magazine again and check your spelling.

# OF CHARACTERS: This means that you have either entered extra characters or missed some characters. Check the line in the magazine again. This error message will also occur if you misspell a BASIC command, but create another keyword in doing so. For example, if you misspell PRINT as PRONT, the 64 sees the letter P and R, the BASIC keyword ON and then the letter T. Because it sees the keyword ON, it thinks you've got too many characters, instead of a simple misspelling. Check spelling of BASIC commands if you can't find anything else wrong.

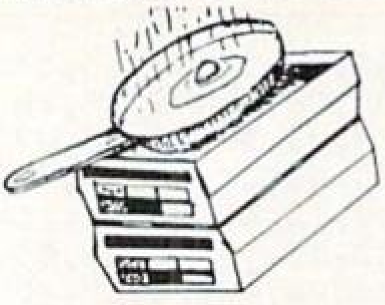
UNIDENTIFIED: This means that you have either made a simple spelling error, you typed the wrong line number, or you typed the checksum incorrectly. Spelling errors could be the wrong number of spaces inside quotes, a variable spelled wrong, or a word misspelled. Check the line in the magazine again and correct the mistake. C

Magazine Entry Program

The Magazine Entry Program is available on disk, along with the other programs in this magazine, for $9.95. To order contact Loadstar at 1-800-831-2694.

```
1 PRINT "[CLEAR]POKING-";
5 P=49152 :REM $C000
10 READ A$:IF A$="END"THEN 80
20 L=ASC(MID$(A$,2,1))
30 H=ASC(MID$(A$,1,1))
40 L=L-48:IF L>9 THEN L=L-7
50 H=H-48:IF H>9 THEN H=H-7
60 PRINT"[HOME,RIGHT12]"P;
70 B=H*16+L:POKE P,B:T=T+B:P=P+1
   :GOTO 10
80 IF T<>103233 THEN PRINT"MISTAKE IN
   DATA --> CHECK DATA STATEMENTS":END
90 PRINT"DONE":END
1000 DATA 4C,23,C0,00,00,00,00,00
1001 DATA 00,00,00,00,00,00,00,0D
1002 DATA 00,58,C1,5E,C1,66,C1,76
1003 DATA C1,83,C1,8F,C1,EA,EA,EA
1004 DATA 4C,83,C0,A2,05,BD,1D,C0
1005 DATA 95,73,CA,10,F8,60,A0,02
1006 DATA B9,00,02,D9,3C,C1,D0,0B
1007 DATA 88,10,F5,A9,01,8D,10,C0
1008 DATA 4C,1F,C1,60,A0,03,B9,00
1009 DATA 02,D9,38,C1,D0,E0,88,10
1010 DATA F5,A9,00,8D,10,C0,4C,1F
1011 DATA C1,60,A0,03,B9,00,02,D9
1012 DATA 34,C1,D0,E0,88,10,F5,A0
1013 DATA 05,B9,A2,E3,99,73,00,88
1014 DATA 10,F7,A9,00,8D,18,D4,4C
1015 DATA 1F,C1,E6,7A,D0,02,E6,7B
1016 DATA 4C,79,00,A5,9D,F0,F3,A5
1017 DATA 7A,C9,FF,D0,ED,A5,7B,C9
1018 DATA 01,D0,E7,20,5A,C0,AD,00
1019 DATA 02,20,A3,C0,90,DC,A0,00
1020 DATA 4C,EA,C1,C9,30,30,06,C9
1021 DATA 3A,10,02,38,60,18,60,C8
1022 DATA B1,7A,C9,20,D0,03,C8,D0
1023 DATA F7,B1,7A,60,18,C8,B1,7A
1024 DATA F0,35,C9,22,F0,F5,6D,05
1025 DATA C0,8D,05,C0,AD,06,C0,69
1026 DATA 00,8D,06,C0,4C,BD,C0,18
1027 DATA 6D,07,C0,8D,07,C0,90,03
1028 DATA EE,08,C0,EE,0B,C0,60,18
1029 DATA 6D,0A,C0,8D,0A,C0,90,03
1030 DATA EE,09,C0,EE,0C,C0,60,0A
1031 DATA A8,B9,11,C0,85,FB,B9,12
1032 DATA C0,85,FC,A0,00,A9,12,20
1033 DATA D2,FF,B1,FB,F0,06,20,D2
1034 DATA FF,C8,D0,F6,20,54,C3,20
1035 DATA 7E,C3,20,E4,FF,F0,FB,A0
1036 DATA 1B,B9,3F,C1,20,D2,FF,88
1037 DATA 10,F7,68,68,A9,00,8D,00
1038 DATA 02,4C,74,A4,4B,49,4C,4C
1039 DATA 54,45,53,54,41,44,44,91
1040 DATA 91,0D,20,20,20,20,20,20
1041 DATA 20,20,20,20,20,20,20,20
1042 DATA 20,20,20,20,20,20,91,0D
1043 DATA 51,55,4F,54,45,00,4B,45
1044 DATA 59,57,4F,52,44,00,23,20
1045 DATA 4F,46,20,43,48,41,52,41
1046 DATA 43,54,45,52,53,00,55,4E
1047 DATA 49,44,45,4E,54,49,46,49
1048 DATA 45,44,00,4E,4F,20,43,48
1049 DATA 45,43,4B,53,55,4D,00,50
1050 DATA 41,52,45,4E,54,48,45,53
1051 DATA 49,53,00,C8,B1,7A,D0,FB
1052 DATA 84,FD,C0,09,10,03,4C,C7
1053 DATA C1,88,88,88,88,88,B1,7A
1054 DATA C9,27,D0,13,A9,00,91,7A
1055 DATA C8,A2,00,B1,7A,9D,3C,03
1056 DATA C8,E8,E0,04,D0,F5,60,4C
1057 DATA F2,C2,A0,00,B9,00,02,99
1058 DATA 40,03,F0,F2,C8,D0,F5,A0
1059 DATA 00,B9,40,03,F0,E8,99,00
1060 DATA 02,C8,D0,F5,20,D7,C1,4C
1061 DATA 56,C2,A0,0B,A9,00,99,03
1062 DATA C0,8D,3C,03,88,10,F7,A9
1063 DATA 80,85,02,20,1B,C3,A0,00
1064 DATA 20,9B,C1,20,CA,C1,20,31
1065 DATA C2,E6,7A,E6,7B,20,7C,A5
1066 DATA A0,00,20,AF,C0,F0,CD,24
1067 DATA 02,F0,06,20,D7,C0,4C,12
1068 DATA C2,C9,22,D0,06,20,BC,C0
1069 DATA 4C,12,C2,20,E7,C0,4C,12
1070 DATA C2,A0,00,B9,00,02,20,A3
1071 DATA C0,C8,90,0A,18,6D,09,C0
1072 DATA 8D,09,C0,4C,33,C2,88,A2
1073 DATA 00,B9,00,02,9D,00,02,F0
1074 DATA 04,E8,C8,D0,F4,60,18,AD
1075 DATA 0B,C0,69,41,8D,0B,C0,38
1076 DATA AD,0C,C0,E9,19,90,06,8D
1077 DATA 0C,C0,4C,60,C2,AD,0C,C0
1078 DATA 69,41,8D,0C,C0,AD,05,C0
1079 DATA 6D,07,C0,48,AD,06,C0,6D
1080 DATA 08,C0,8D,0E,C0,68,6D,0A
1081 DATA C0,8D,0D,C0,AD,0E,C0,6D
1082 DATA 09,C0,8D,0E,C0,38,E9,19
1083 DATA 90,06,8D,0E,C0,4C,96,C2
1084 DATA AD,0E,C0,69,41,8D,0E,C0
1085 DATA AD,0D,C0,E9,19,90,06,8D
1086 DATA 0D,C0,4C,AB,C2,AD,0D,C0
1087 DATA 69,41,8D,0D,C0,A0,01,AD
1088 DATA 0B,C0,CD,3C,03,D0,20,C8
1089 DATA AD,0C,C0,CD,3D,03,D0,17
1090 DATA C8,AD,0D,C0,CD,3E,03,D0
1091 DATA 0E,AD,0E,C0,CD,3F,03,D0
1092 DATA 06,20,64,C3,4C,7A,C0,AD
1093 DATA 10,C0,D0,11,98,48,68,4C
1094 DATA F7,C0,AD,10,C0,F0,01,60
1095 DATA A9,04,4C,F7,C0,A4,FD,A9
1096 DATA 27,91,7A,A2,00,C8,BD,0B
1097 DATA C0,91,7A,C8,E8,E0,04,D0
1098 DATA F5,A9,00,91,7A,20,64,C3
1099 DATA 4C,7A,C0,A0,00,B9,00,02
1100 DATA F0,11,C9,28,D0,03,EE,03
1101 DATA C0,C9,29,D0,03,EE,04,C0
1102 DATA C8,D0,EA,AD,03,C0,CD,04
1103 DATA C0,D0,01,60,A9,05,4C,F7
1104 DATA C0,A9,20,8D,00,D4,8D,01
1105 DATA D4,A9,09,8D,05,D4,A9,0F
1106 DATA 8D,18,D4,60,20,41,C3,A9
1107 DATA 81,20,77,C3,A9,80,20,77
1108 DATA C3,4C,71,C3,20,41,C3,A9
1109 DATA 11,20,77,C3,A9,10,20,77
1110 DATA C3,A9,00,8D,04,D4,60,8D
1111 DATA 04,D4,A2,70,A0,00,88,D0
1112 DATA FD,CA,D0,FA,60,END
```

DON'T READ THIS
IF YOU'RE COOKING ON YOUR DRIVES!!



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TREASURE ISLAND

Continued from pg. 24

land called Oz—accompanied, of course, by your little dog Toto and three very unusual sidekicks.

Your adventure as Dorothy begins with a sudden distant flash of lightning. From way across the dull, endlessly flat Kansas horizon, you see it coming fast and furious. Tornado! The devilish black funnel hungrily races toward the little farmhouse where you live with your aunt and uncle. With no time to reach the shelter of the cellar, you scoop Toto up in your arms and race back into the house. The whole world starts to rattle and shake, and the sound of the monster wind builds to an unbearable roar. Then, with a deep strained shudder and a mighty crash, the entire house is uprooted, and spins wildly upward into the gaping mouth of the cyclone.

But high up in the belly of the snake-like storm, the spinning gives way to an almost hypnotic, gentle rocking, and despite your fear, you are soon lulled into a deep sleep. Hours later you are rudely awakened by a sharp bump and crash. The house is quiet and still. Carefully, cautiously, you open the front door and take your first small, tentative step . . . over the rainbow.

A number of helpful commands are common to both of these Windham adventures: CREATE, SAVE, RESTORE, RESTART, and QUIT. These allow you to create a disk, save a disk, save a current game position, restore a particular game position, restart play from the beginning of the story, or end a playing session. But three additional commands, WORDS, PICTURESON and PICTURESOFF, are exclusive to Windham adventures.

The command WORDS summons up the WordWindow, an innovative help feature to make play more enjoyable. If at any time you are having difficulty with commands, simply type the word WORDS, and a list of all the verbs and nouns suitable for the particular scene you are playing will appear. Peruse the list for ideas, and then either hit any key to go back to your game, or hit the spacebar to see another screen of additional words. I found WordWindow to be a more than welcome addition to adventuring—particularly useful at those inevitable points in play when you are literally at a loss for words.

Treasure Island and *The Wizard of Oz* are accompanied by gorgeous graphic images, but, for you diehard Infocom addicts out there, typing PICTURESOFF will present you with a familiar text-only game. Of course, any time you happen to be feeling adventuresome, just type PICTURESON. This way, you can slowly wean yourself onto the idea of using pictures on the screen as a natural compliment to the pictures in your mind.

Treasure Island and *The Wizard of Oz* both offer a reasonably large vocabulary. I counted well over 200 nouns, close to 100 verbs, and around 60 additional words, such as adjectives, pronouns and prepositions, that are recognized within *The Wizard of Oz*. And Windham's capable parser allows you to combine all those words into intelligible, complete sentences such as "Take the map and kick Long John," "Give Billy rum then ask Billy about pirates," or "Toto, bite the wicked witch." However, if patience is not a virtue, you can also use certain short phrases such as "look," "examine object," "inventory," and "who," as well as specific abbreviations like "U" for up, "E" for east, and "TM" for Tinman.

For those of us who have already read these books, Windham Classics provide the ultimate re-experience of far-away lands, beloved old friends, and long-feared villains. But particularly for those of us whose children look upon reading a thick novel as an old-fashioned form of slow torture inflicted upon them by teachers and parents, Windham's adventures are a marvelous new way to expose them to classic literature—and they'll never even know it unless you tell them. But *do* tell them, eventually. An introduction to adventure classics, the "Windham way" can very possibly lead to a minor miracle. For after they've *played* the story, they just might want to actually *read* the story.

Whether you lean toward action-adventure like *Treasure Island* or the fantasy-adventure of *The Wizard of Oz*, I wholeheartedly recommend that you treat yourself to the experience of a Windham Classic.

So play yourself a good novel. Superbly written hint books have been available at your local library for decades. ◼

COMMODORE'S NEWS FROM THE BACK

Computer Accessories

Suncom has introduced The Notcher, a device that makes single-sided computer diskettes double-sided, and a Wet System Disk Head Cleaner. Both products are designed for use with 5-1/4 floppy disks.

The Notcher, while not intended to render the disk's second side useful for primary data storage, provides the user with a convenient way to manufacture back-up or duplicate copies of important data disks. It punches out a notch on single-sided disk jackets in the locations reserved for "write-protect" notches on double-sided disks.

Suncom's Wet System Disk Head Cleaner removes particulate matter, smoke residue, dust and corrosion which build up on disk heads after extended periods of use.

The Notcher retails for $9.95 and the Disk Head Cleaner retails for $7.95. (Suncom, 260 Holbrook Drive, Wheeling, IL 60090)

OKIDATA
OKIMATE 20
OKIMATE 20

Inexpensive Color Printer for Amiga

Amiga users can now print the Amiga's 4,096 colors using Okidata's Okimate 20 and Plug 'N Print Kit. The Okimate 20 is a ribbon-transfer color printer with multiple functions and capabilities. In the word processing mode, the Okimate 20 prints 80 characters per second in standard type, with letter-quality capabilities at 49 characters per second. Users also have the option of several type fonts, including wide print, boldface, fine print, and italics. Underlining, superscripts and subscripts are standard features.

The Okimate 20 has a 24-element printhead, built-in friction and pin feed paper, variable-width tractor feed, and an 8K buffer. Users can print in either 80 standard columns or 132 columns using condensed type.

The Plug 'N Print kit contains an interface module, data cable, cartridge ribbons (color and black), sample computer paper, and instructions. The Amiga has the Okimate 20 built into its menu so users can transfer full-color, high-resolution images from the screen to the printer without outside programs.

The printer retails for $169 and the Amiga Plug 'N Print retails for $99. (Okidata, 532 Fellowship Road, Mt. Laurel, NJ 08054)

Telecommunications via Packet Radio

A petition to create a new radio communications service specifically for personal computer owners was recently filed with the Federal Communications Commission (FCC). The proposed service would allow computer owners to exchange messages, bulletins, computer programs and other information via packet radio in much the same way that information is exchanged using a modem and telephone. The radio service, however, would have no connect-time or phone-line charges, although users would have to purchase a special radio modem to access the service.

Don Stoner, of Mercer Island, Washington, who filed the petition with the FCC in October 1985, has dubbed the service Public Digital Radio. In his petition, Stoner proposed that the FCC designate a wideband packet radio channel exclusively for the purpose of computer communication. The channel he proposes to use for Public Digital Radio is an "underoccupied" channel between 52 and 54 MHz.

Packet radio, according to Stoner, works like the radio equivalent of the Postal Service. A message is "addressed" to a recipient and sent out over the air waves at extremely high speeds. It is passed along via a network of other users until it reaches its destination. Its main limitation is distance. The signal must be picked up and passed along by another "node" within about a mile or it fades and is lost.

If you would like to support Stoner's petition, write to the Federal Communications Commission, Washington, D.C. 20554. Reference Donald L. Stoner's proposal for the creation of a Public Digital Radio Service, Rule Making Number RM-5241, submitted October 20, 1985.

D.B.'S CHEAPSHEET

Continued from pg. 109

```
500 :'ABHY
510 REM  LINES # 57-75'BLYD
520 :'ABHB
530 FOR X=1 TO 18'DEAE
540 PRINT#1,S1$+B6$+S1$+S3$+B6$+LEFT$
    (S2$,29)+B6$+S1$+S3$+SP$+B6$'MPQT
550 NEXT'BAEE
560 :'ABHF
570 REM  LINES # 76-77'BLCJ
580 :'ABHH
590 PRINT#1,S1$+B6$+S1$+S3$+B4$;'FSIP
600 FOR X=1 TO 14:PRINT#1,B3$;:NEXT
    :PRINT#1,B2$+S1$+S3$+B6$+S1$+S3$+
    SP$+B6$'NOWQ
610 PRINT#1,S1$+B6$+LEFT$(S2$,29);
    'ERHH
620 PRINT#1,B4$;:FOR X=1 TO 14
    :PRINT#1,B3$;:NEXT:PRINT#1,
    B5$+S1$+S3$+SP$+B6$'LMYQ
630 FOR X=1 TO 4:PRINT#1,BL$:NEXT'FKXI
640 :'ABHE
650 REM  LINES # 82-89'BLCI
660 :'ABHG
670 PRINT#1,S1$+B6$+S1$+S3$+B1$;'FSFO
680 FOR X=1 TO 29:PRINT#1,B3$;:NEXT
    :PRINT#1,B2$+S1$+S3$+SP$+B6$'KFXU
690 FOR X=1 TO 6'DDYL
700 PRINT#1,S1$+B6$+S1$+S3$+B6$+LEFT$
    (S2$,29)+B6$+S1$+S3$+SP$+B6$'MPQR
710 NEXT'BAEC
720 PRINT#1,S1$+B6$+S1$+S3$+B4$;'FSIK
730 FOR X=1 TO 29:PRINT#1,B3$;:NEXT
    :PRINT#1,B5$+S1$+S3$+SP$+B6$'KFBQ
740 :'ABHF
750 REM  LINES # 90-'BJTI
760 :'ABHH
770 FOR X=1 TO 6:PRINT#1,BL$:NEXT'FKAN
780 PRINT#1,S1$+B4$;'CJCM
790 FOR X=1 TO 60:PRINT#1,B3$;:NEXT
    :PRINT#1,B5$'GSDR
800 :'ABHC
810 REM  END OR REPEAT'BLYG
820 :'ABHE
830 PRINT#1:CLOSE 1'CDLG
840 PRINT"[HOME,DOWN10]
    ANOTHER COPY (Y/N)[SPACE2]N";
    :INPUT"[LEFT3]";R$'CFTQ
850 IF R$<>"Y"THEN PRINT"[CLEAR]"
    :END'GDBM
860 RUN'BAMI
870 :'ABHJ
880 REM  INITIALIZE GRAPHIC
    VARIABLES'BBYS
890 :'ABHL
900 B1$="[CMDR A]":B2$="[CMDR S]"
    :B3$="[SHFT *]":B4$="[CMDR Z]"
    :B5$="[CMDR X]":B6$="[SHFT -]"
    :SP$=" "'HCLS
910 S1$="[SPACE10]"'BDDG
920 S2$="[SPACE40]"'BDPL
930 S3$="[SPACE4]"'BDTH
940 BL$=S1$+B6$+S2$+S1$+S1$+B6$'GVRP
950 RETURN'BAQI
```

END

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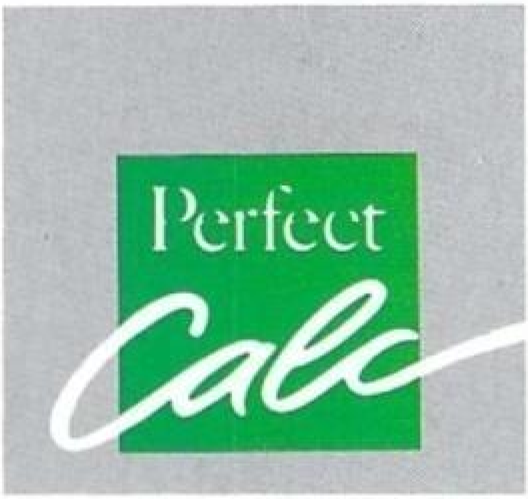

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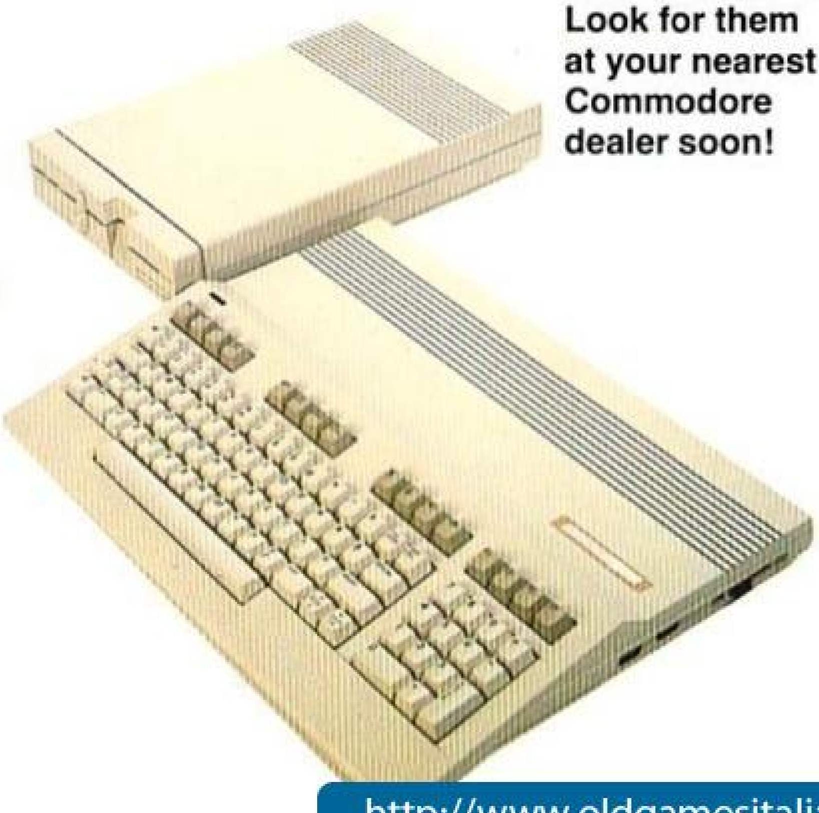

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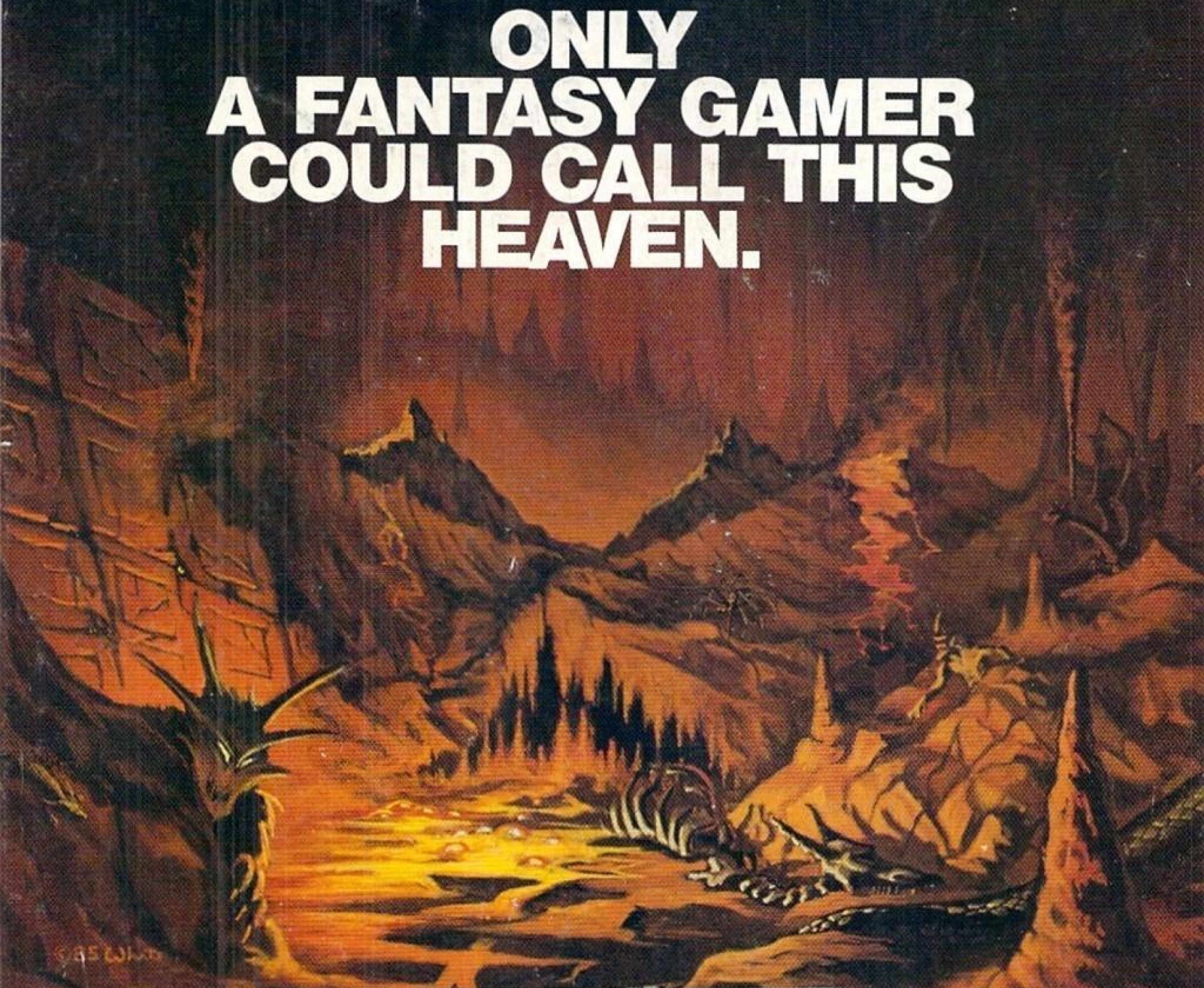

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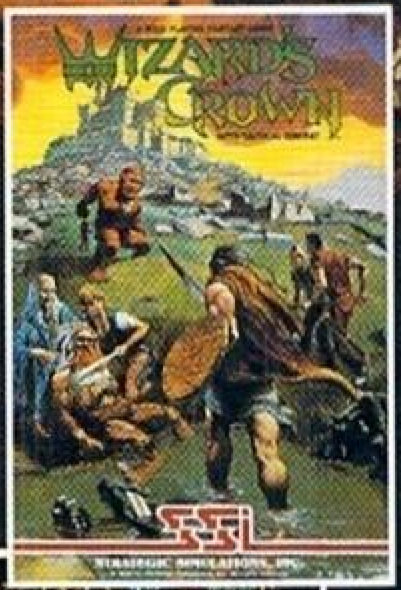

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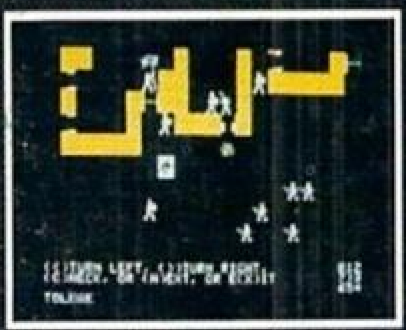

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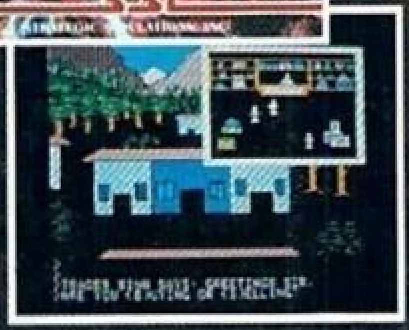

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